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Preface

This document is a user's guide for the Electrical functionality of Intergraph Smart[™] 3D and provides command reference information and procedural instructions.

Documentation Comments

For the latest support information for this product, comments or suggestions about this documentation, and documentation updates for supported software versions, please visit *Intergraph Smart Support (https://smartsupport.intergraph.com)*.

What's New in Electrical

The following changes have been made to the Electrical task.

Version 2016 (11.0)

- Updated the Cable Schedule dialog box with new commands to review the retrieved cables.
 For more information, see Cable Schedule Dialog Box (on page 273).
- You can now move or delete objects at boundary connections while maintaining the electrical design intent. For more information, see *Appendix: Moving at Boundary Connections* (on page 284) and *Appendix: Deleting at Boundary Connections* (on page 296). (P2 CP:249685, P2 CP:267185, P2 CP:268379, P2 CP:264940, P2 CP:248568; CP:300832)
- Added a new **Disconnect** command that allows you to disconnect route objects without disturbing the rest of the network. For more information, see *Disconnect Command* (on page 265). (P2 CP:293435)
- You can slide a branch leg along a header run without disconnecting the branch. For more inofrmation, see *Move a cableway branch* (on page 139), and *Move a conduit branch* (on page 148) (P2 CP:293434)
- You can now select a straight feature on a run, and move the feature to connect the run to an adjacent run. For more information, see *Move a set of cableway features* (on page 141) and *Move a set of conduit features* (on page 146). (P2 CP:300832)
- You can select a section of electrical network using the new route selection commands. For more information, see *Route Selection Commands* (on page 133). (P1 CP: 248690, P2 CP:293434, P1 CP:297357)
- Added a new Quick Route → command that enables you to join two existing cableway segments or conduit segments. For more information, see Quick Route (on page 248). (P1 CP:248716; P1 CP:248717; P3 CP:288004; P3 CP:290874; P3 CP:290886; P2 CP:291085)
- Added a new locate filter, Construction Graphics. For more information, see Edit Properties (on page 157). (P2 CP:271166)
- You can now select cable tray partitions using the Enclosed Runs option in the Locate Filter. To select an entire cable tray run, use the Enclosing Runs option. You can add barriers to an existing cable tray. You can also modify, and delete the partitions of a cable tray. For more information see, Cable Trays (on page 18). (P2 CP:186222)

- You can now select conduits in a duct bank using the Enclosed Runs option in the Locate Filter. To select an entire duct run, use the Enclosing Runs option. You can also move or delete the duct bank along with its conduits. For more information see, *Duct Banks* (on page 24). (P3 CP:276232)
- You can now set the software to remember the last used working plane when routing cableway or a conduit. For more information, see *Defaults Tab (Cableway Settings Dialog Box)* (on page 60) and *Defaults Tab (Conduit Settings Dialog Box)* (on page 109). (P4 CP:258470)

SECTION 1

Electrical

The Electrical task uses point-by-point route design to insert cableway, cable tray, and conduit components into a 3-D model. After routing the cableway, cable tray, and conduit components, you can place cables to route through them.

NOTE A cableway represents a path for a cable tray or bare cables. The cableway has no physical counterpart; it simply reserves space. Cable tray, on the other hand, does have a physical counterpart.

For models that include underground placement of electrical cables, the software provides a duct bank option which allows you to draw the cableway and place conduits at the same time. The duct bank object lets you design conduits of the same specifications or individualize each conduit run, if needed.

Electrical Systems

Electrical systems are a way of organizing electrical objects such as cableways and conduits, within the system hierarchy of your model. You also use the electrical system to control the specifications that can be used within the system, such as conduit, cableway, and cable tray specifications.

You can create and organize electrical systems using any criteria you choose. For example, you could base an electrical system on the area where the objects are located; you could also base an electrical system on the designer who models the cableway.

You create electrical systems in the Systems and Specifications task or by right-clicking the objects on the **System** tab in Workspace Explorer. Electrical systems can later be reorganized in the system hierarchy based on your access privileges to the permission groups.

The Electrical task includes the following commands:

Q	Select - Resets all commands and allows you to select objects in the model. For more information, see Select in the <i>Common User's Guide</i> .
7	Route Cableway - Creates a new cableway, duct bank, or cable tray; extends an existing run; or routes to an end feature. For more information, see <i>Route Cableway</i> (on page 33).
√	Route Conduit - Creates a new conduit run or extends an existing run. For more information, see <i>Route Conduit</i> (on page 88).
Đ	Insert Transition - Adjusts the cableway to accommodate combinations of change in shape and size, manually places and modifies a transition, and indirectly changes a cross-section in the cableway routing. For more information, see <i>Insert Transition</i> (on page 164).
j	Insert Component - Adds a component into a cableway or conduit run. For more information, see Insert Component (on page 178).

7	Auto Connect Cableways - Automatically places the fittings needed to connect a cableway. Zero spec cableway (Cws-0) is routed between existing cableways and the new cableway is automatically placed. For more information, see <i>Auto Connect Cableways</i> (on page 190).
Ø	Place Equipment - Selects any equipment from the Catalog and places it in the model and modifies the offset of the equipment and its relationships. You can mate, connect, or align equipment, and precisely position the equipment. For more information, see <i>Place Equipment</i> (on page 194).
*	Insert Cable - Creates a new cable run in the model. You define the properties of the cable run by defining the relationship of the cable run to other objects in the model, such as pieces of equipment or electrical cabinets. For more information, see <i>Insert Cable</i> (on page 214).
>	Edit Cable Path - Routes cables through the various cableway trunks and conduits that exist in the model. You can force the cable to go through a particular cableway or force the cable to detour a particular cableway. For more information, see <i>Edit Cable Path</i> (on page 221).
-	Insert Cable Marker - Places cable markers at points along cableway or conduit features. For more information, see <i>Insert Cable Marker</i> (on page 234).
•	Insert Split - Places a splice plate or other type of split in the selected cable tray. For more information, see <i>Insert Split</i> (on page 239).
123	Sequence Objects - Renames objects in the selected conduit, cable tray, or WBS item such that the names are in order, based on topology. For more information, see <i>Sequence Objects</i> (on page 246).
iHi	Quick Route - Joins two existing cable tray or conduit segments in the model. For more information, see <i>Quick Route</i> (on page 248).
	Set View by Cable - Assists the designer when routing cable by only showing objects of interest and hiding non-applicable objects in the model. This command is located on the View menu. For more information, see <i>Set View by Cable</i> (on page 233).
	View Cable Schedule - Displays a list of the retrieved cable schedule documents. This command is located on the SmartPlant menu. For more information, see View Cable Schedule (on page 270).

In This Section

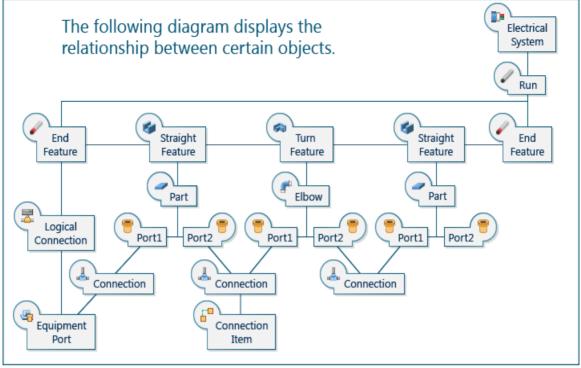
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The Routing Paradigm

The routing process is the same for cableway, cable tray, conduits, cables, and duct banks. The following terms describe the different objects that you might work with during a modeling session:

- Run An unordered list of items that make up the routing entity with which you are working. In other words, the length of your cableway from start to finish.
- Leg An ordered list of items that are routed in one direction make a leg.
- **Feature** An object that comprises part of a routing entity in the model. You are free to move the feature at any time during the design process. Features are designs with intent; that is, you use features to route the entity to suit your model's design. Features include the following:
 - Along-leg feature A logical object that represents a feature along the leg of a cable way, such as a tee.
 - End feature An object that represents either end of the routing entity.
 - Straight feature An object that represents a straight section of the routing entity.
 - Turn feature An object that composes part of a routing entity in the model. The turn feature represents a change in direction for the routing entity.
 - Transition feature An object that represents a change of cross-section of the routing entity.
 - Parent feature An object that represents a feature that includes an additional feature, such as an insulated straight feature.
- Part Item selected from a catalog, such as elbows or tees that allow you to turn corners.
- Port An open end of a part.
- Connection The junction where a port meets the routing entity or another part. The connection can be sealed or unsealed.
- Connection Item Items that seal a connection, such as welds or bolts.
- Boundary connection A boundary is a port of the terminal object in a select set.
 Boundaries can exist at line change, run change, branch point, and at split.

The following image displays the relationships between some of these objects:



Cableways

Cableways are logical objects used in the 3D model to reserve space for cable trays and cable. The reserved space also allows interference checking along the route. That is, if any other object is in the same space, a clash results which can be resolved in the modeling phase.

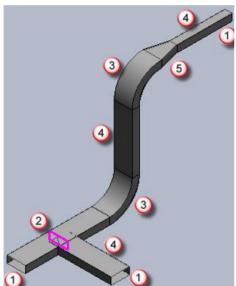
Cableway Run

A cableway run is a connected series of features that normally have the same specification. All cableway features belong to a run.

Cableway Features

When you route a cableway, you place features as you go. These features define high-level design information that allows you to create your model to your requirements. As you route cableway, the software automatically selects specific parts based on the specification of the run. You may freely move features about at any time during the design process.

The following illustration shows a cableway run and its features.



- 1 End Features
- 2 Along-Leg Feature (highlighted)
- 3 Turn Features
- 4 Straight Features
- 5 Transition Feature

■ NOTES

- By default, the software uses fast mode routing, which means that you do not see elbows and turns graphics appear while in dynamic display. You can toggle fast mode routing on and off by pressing SHIFT+F.
- When you start routing a branch from a cableway, the branch does not inherit all the properties from the header run. However, the Specification, Fill Efficiency, Signal Type, and Voltage Grade boxes inherit the values from the header run. (A header run is the main length of cableway from which other cableways can branch into or out of.)
- You must use zero-spec cableway (Cws-0) in your cableway network if you want to later route cable across gaps in the tray. For more information, see *Routing Cable in Disconnected Networks* (on page 212).

Cable Trays

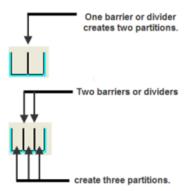
A cable tray is a physical unit that supports and routes cable.

Cable Tray Run

A cable tray run is a connected series of cable tray features that normally have the same specification. Cable tray features belong to a corresponding cable tray run.

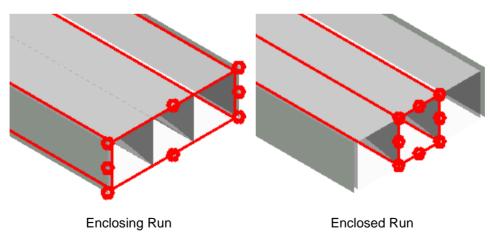
Cable Tray Barriers

You can use barriers to divide a cable tray into lengthwise partitions. Each partition is treated as a separate cable tray, so that you can route cables of supported signal type. The following illustration shows how one barrier creates two partitions and two barriers create three partitions and so on. Smart 3D reports all the cables it supports, as well as the cumulative loads of all of the zones.



Enclosing Run and Enclosed Run

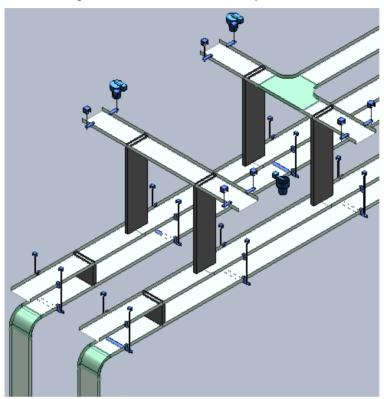
To modify a cable tray partition, select **Enclosed Runs** from the **Locate Filter**. To select an entire cable tray select **Enclosing Runs**.



Cable Tray Features

When you are routing cable tray, the software automatically selects the specific parts for the features based on the specification of the run. You may freely move features about at any time during the design process.

The following illustration shows a cable tray network and some of its features.



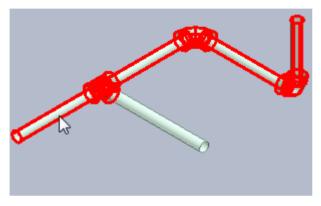
As the cable trays are modified, cable lengths are automatically adjusted. When new cables are added, the fill of the cable tray is calculated. You can view the maximum fill on the ribbon or **Properties** dialog box for straight features. When you click on **MaxFill** command, the software highlights the portion of the cable tray with maximum cable fill.

Conduits

Conduits are the hollow tubing used to house and protect cables. If you are routing duct banks, you can define the conduits to be drawn simultaneously with the encasement. If necessary, you can modify the conduit design later.

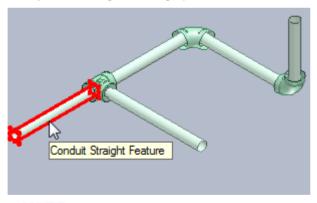
Conduit Runs

A conduit run is a connected series of features that normally have the same specification. A conduit run includes straight features; along-leg features such as branches, transitions, and reducers; turn features; and end features.



Conduit Features

All conduit features belong to a corresponding run. When you route a conduit run, you place conduit features as you go that define high-level design information. You can move the features at any time during the design process.

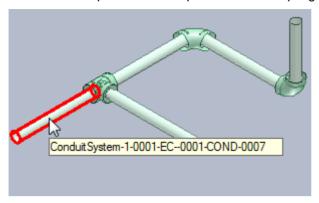


■ NOTE By default, the software uses fast mode routing, which means that you do not see elbow or turn graphics while in dynamics. You can toggle fast mode routing on and off by pressing SHIFT+F.

Conduit Parts

Conduit parts are the physical components that compose a conduit feature. Part size and properties depend on the specification. The software selects the specific parts based on the

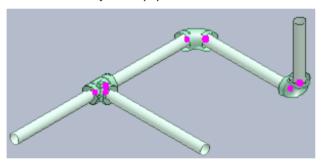
specification of the run. You can select conduit parts from the catalog to place in your conduit network. Examples of conduit parts include couplings, unions, and tees.



Connecting Conduits

The software automatically generates connections when you join components together. Connections will either generate parts or not generate parts (implied connection parts) depending on the type.

Connections are used at the junction of conduit parts, conduit to equipment, and conduit to cable tray and cable tray parts. The behavior of conduit connections matches piping connections. Connections are created when a straight feature joins another straight feature, and when a conduit joins equipment.



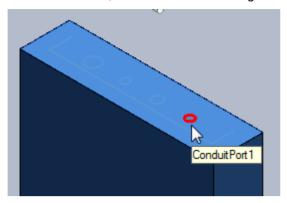
A relationship is created when you route a cableway from a conduit end feature, or the reverse, but not when you route a cable tray from a conduit end feature, or the reverse.

You can view the connection properties using the **Edit > Properties** command or generate reports for the connection information. You can also change a generated connection part with another part if it exists in the current specification. To edit or replace the connection part, use the connection property pages.

Connecting Conduits to Equipment

Conduit connects to equipment at a conduit port location. The software automatically places a connection part based on the default part listed in the catalog. The part generation depends on the connecting end preparations and the conduit properties. For example, if the conduit

connection is threaded, the conduit threads directly into the equipment surface. Because of the direct connection, the software does not generate a connection part.



Copying equipment does not affect any cables or conduit connected to the original equipment. Also, modifying equipment does not affect any cables or connected conduit unless you modify the port. If you change the port size of an equipment nozzle, the software places a reducer at the junction of the connected conduit.

Differences Between Conduits and Piping

The process of routing conduits and pipes share many conceptual similarities. However, differences do exist between the two disciplines.

- Conduit routing does not import data from any schematic drawing tool, such as a P&ID.
- Conduit does not have insulation.
- As compared to piping, conduit does not have property for fluid, flow direction, insulation, heat tracing, or jacketed piping.
- Conduit does not have temperature limits.
- No welds are required for conduit. Unlike piping, all conduit fitting connections are threaded in male/female connections and compression types.
- Branch reporting ownership does not apply to conduit.
- Conduit does not have isometric drawing output, but only orthographic drawings.
- Conduit does not have bolted or through-bolted connections.
- Nuts or washers are not associated with conduit.
- You can use gaskets in conduit clamped or compression connections.
- Standard reports and material take-off reports do apply to conduit.
- For conduit, you can insert splits, such as couplings and unions, with the **Insert Component** command. For piping, you use the **Insert Split** command.
- The nominal diameter for conduit is specified as the inside diameter, similar to small bore piping. Reference data stores this information.
- Conduit does not have a system level corresponding to pipelines.
- You cannot place pipes in a conduit system, and you cannot place conduit in a pipeline.

 You cannot modify the turn type for a conduit. The part definition in the specification controls the turn type.

Cabling

A cable is bound or sheathed group of mutually insulated conductors. When working with cables, the software lets you choose the specific cable type required.

Cable Run

The length of a cable, from start to finish, is called a cable run.

When you add a cable run, you define the properties of the cable run. In addition, you define the relationship of the cable run to other objects in the model, such as electrical cabinets and equipment.

Parallel Cables

You can create parallel cables by entering a number greater than 1 for the **Parallel Cables** property on the **Cable Properties** dialog box. The software then creates a parallel cable (parent) and multiple paralleled cables (children). For more information, see *Cable Properties Dialog Box* (on page 219).

Autorouting Cable

You can automatically route cables using **AutoRoute** on the **Edit Cable Path** ribbon. After you define necessary cable properties, originating and terminating equipment information, the software routes the cable along the shortest path through the cable trays or conduits. If necessary, you can modify the autorouted path by specifying additional must-include cable trays or conduits for the selected cable.

★ IMPORTANT You must assign a signal type for the cable, cable trays, and conduits to autoroute cables.

Editing Cable Path

After the software automatically routes the cable, you can edit the cable path so that the cable runs through the selected cable trays and conduits. To define the path manually, select the entry point, the way features through which the cable should pass, and then the exit point.

TIP If you do not have cableways and conduit in your model, use the Route Cableway and Route Conduit commands to create them.

Max Fill

As you route a cable, you can view the maximum fill for the cable tray or conduit by checking the **Max Fill** box on the ribbon. If you click **Max Fill**, the software highlights the corresponding tray or conduit containing the maximum fill. The software also calculates the maximum fill during the autorouting process. You can allow overfilling of the cable trays or allow real-time fill calculations during the routing process.

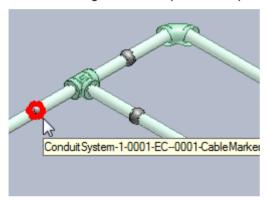
Fill calculations are based on the National Electrical Code (NEC) standard. The software performs the calculations using a Microsoft Visual Studio module that can be customized based on the project requirements.

TIPS

- You can use surface style rules to show which cable trays are full and which trays are nearly full.
- You can run a cable fill report for cable trays and conduits.

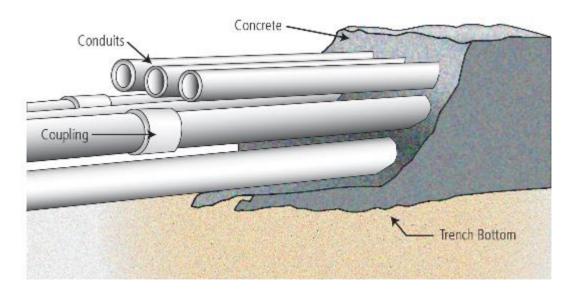
Place Cable Markers

You can place markers on cableways or conduit features to designate the path of the cables. You can later generate a report on the paths and use the information as required.



Duct Banks

A duct bank is the concrete-encased underground container used for laying conduits for electric and telephone lines, as well as other utilities. In general, two or more conduits routed side-by-side create a bank. Duct banks are generally sloped to drain off condensation.



A duct bank system consists of the following:

- Duct banks entering the ground
- Duct banks exchanging cables at pull pits or manholes
- Duct banks emerging from the ground

The software allows you to route both the casing and its conduits simultaneously. You can later customize each conduit, as necessary. In addition, you can also join a conduit in one duct bank with a conduit in another duct bank at a pull pit or manhole using the **Auto Connect** command. After modeling, you can generate drawings and reports for the duct banks.

You create duct banks using the Route Cableway command. On the Create New Run dialog box, you select the duct bank specification and the Multi-Route tab changes to the Duct Bank tab. You use this tab to design the duct bank. You can set all conduits to the same size and relative position, or you can define the individual conduit runs on the Duct Bank tab. For more information, see Routing Duct Banks (on page 125).

Recommended Work Flow

We recommend that you route the entire duct bank as a continuous segment. Routing two or more discontinuous segments might duplicate the cross-section values for each segment. You need to resolve any incompatibilities that might arise during the merging of discontinuous segments.

Modifying Duct Banks

After you have modeled the duct bank, you might need to modify it. The available modifications include the following:

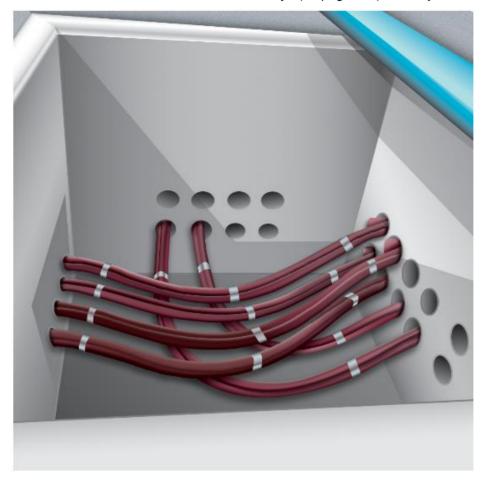
- Delete or move the duct bank as a whole or move a section of the duct bank.
- Extend or shrink the duct bank.
- Change the angle of the turns.
- Modify the relative position of a conduit in a duct bank.
- Add or remove conduit from the duct bank.
- Merge two segments of a duct bank.

CAUTION Before merging two duct bank segments, make sure that the conduits have matching cross-sections and signal types or merge the two segments using **Auto Connect**.

Pull Pits and Manholes

Pull pits are concrete chambers where a cable from a conduit in one duct bank is fed to a conduit in another duct bank. Use **Place Equipment** but to place the pull pit. You can route duct banks out of the pull pit. To route cables in the duct bank, the cable paths must be contiguous.

Use Auto Connect and zero-spec cableway (Cws-0) to connect the conduits at the pull pit. For more information, see *Auto Connect Cableways* (on page 190) to easily connect the conduits.



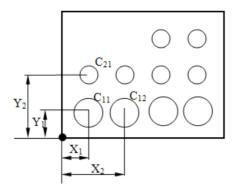
Branching Duct Banks

A duct bank might need to branch at some point to reach all of its destinations. When branching occurs, the number of conduits from the original duct bank might not match the number of conduits in the branch. That is, each branch may carry only a subset of the original conduits.

TIPS

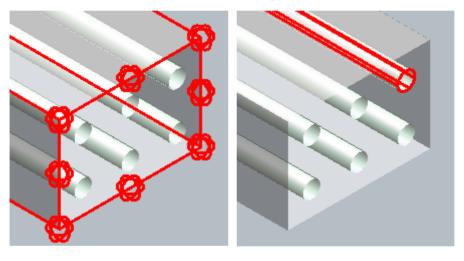
- To route duct banks, select the DBS-0 duct bank specification on the New Cableway dialog box.
- To successfully move the duct bank, select the entire duct bank: conduits and encasement.
- Use Format > Surface Style Rules to set the pull pit color to translucent so that you can
 accurately branch the cables. You can also set the encasement color to translucent. Setting
 the encasement to translucent is also helpful. You can set the colors use Format > Surface
 Style Rules.

 On the Duct Bank tab cross section, row 1 (x) is at the bottom and column 1 (y) is on the left



Enclosing Run and Enclosed Run

To modify a conduit in the duct bank, select **Enclosed Runs** from the **Locate Filter**. To select an entire duct run select **Enclosing Runs**.



Enclosing Run

Enclosed Run

Permission Groups and Routing

Several different users in different permission groups can work together when routing if you know how the software handles the different situations. Starting in version 6.0, Electrical fully supports different users, with different sets of privileges, working on different runs such as when working in a Global Workshare Configuration.

Prior to version 6.0, pipe route legs could be shared between pipe runs. In version 6.0 and later, the software creates an Intermediate End Feature (IEF) at the end of a pipe run connected to another pipe run and creates a logical connection between the two IEFs/runs. The legs stop at the IEF and are no longer shared between pipe runs. You do not need to create a separate permission group for the pipe run and for the features of the pipe run. Everything can now be in the same permission group.

Assignment of Permission Groups

The first thing to know is how permission groups are assigned:

- Objects that you create directly are assigned to the active permission group.
- Objects created automatically by the software are assigned a permission group determined by an internal set of rules. The permission group assigned is not necessarily the active permission group. Examples of automatically placed objects include connections and a pipe automatically inserted when two touching valves are separated.
- Parts generated by features are assigned the permission group of the parent feature.
 Remember, however, that runs can be in a different permission group than its collective features and parts.
- End features use the permission group of the run to which they belong.
- Connections use the permission group of the parts to which they are connected. If the connection is between parts with different permission groups, the permission group to which the user has write access is used. If the connection is between an equipment nozzle and a route part, the route part permission group is used for the connection.
- Piping connection objects (welds, bolt sets, gaskets, clamps) use the permission group of the connection that generated it.

Systems and Permission Groups

A system is a logical grouping of sub-systems. When you add or remove a sub-system, you are modifying the definition of the parent system. Therefore, you must have write access to the parent system. You do not need write access to the grandparent system. For example, to create a pipe run, you need write access to the parent pipeline. However, you do not need access to the system to which the pipeline belongs.

When participating in a Global Workshare Configuration, you must manage all permission groups at the host site. The sub-system requirement to have write access to its parent system is not possible if the sub-system's permission group is created at the satellite site and the parent system's permission group is created at the host site.

For example, your host site is Houston and your satellite site is London. You create a system called "Pipe Rack 100" and its controlling permission group in Houston. You assign user John, who works in London, write access. During the workshare replication process, the "Pipe Rack 100" system and permission group is "duplicated" in London. In London, John can add columns, beams, braces and whatever else he wants to the "Pipe Rack 100" system because John was

given write access to the system's permission group in Houston. John cannot delete or change any of the properties of the "Pipe Rack 100" system in London because the host site, Houston, owns it. He can only "add" objects to the system. If John were to travel to Houston and log on there, he could delete or change any of the properties of the "Pipe Rack 100" system because the Houston host site owns it.

Example Configuration A

In this example, two users, John and Peter, are working on the same run with exclusive access. John is responsible for part of the run, and Peter is responsible for the other part of the run. Neither John nor Peter should be able to modify the work of the other person. The administrator should configure the permission groups as follows:

Create three different permission groups: PG-Run, PG-John, and PG-Peter. Both John and Peter should have full control access to PG-Run. John should have full control access to PG- John while Peter should have read-only access to PG- John. Peter should have full control access to PG- Peter while John should have read-only access to PG- Peter.

The run should be created using the **PG-Run** permission group. When John works on his parts of the run, he should use **PG-John** as the active permission group. When Peter works on his parts of the run, he should use **PG-Peter** as the active permission group. The two halves of the run should connect at a component such as a valve (piping) or a union (electrical).

Piping Example: For example, John routes his part of the run, places a flange, and then places a gate valve. Peter then places a flange manually connecting to the open port of the gate valve, and then continues his part of the run.

Electrical Example: For example, John routes his part of the run, and places a coupling. Peter then manually connects to the open port of the coupling, and then continues his part of the run.

Example Configuration B

In this example, two users, John and Peter, are working on different but in-line connected runs with exclusive access. For example, John places an elbow, a straight piece, and a union, then stops. Peter connects to the open port of the union, and then continues routing. The administrator should configure the permission groups as follows:

 Create two different permission groups: PG-John and PG-Peter. John should have full control access to PG-John while Peter should have read-only access to PG-John. Similarly, Peter should have full control access to PG-Peter while John should have read-only access to PG-Peter.

John should create the run using the **PG-John** permission group and route his part of the run. When Peter works on his part of the run, he should use **PG-Peter** as the active permission group. The Intermediate End Features will handle the connection between the two parts of the run.

Example Configuration C

In this example, two users, John and Peter, are working on different runs connected by branching components such as a tee. The administrator should configure the permission groups as follows:

Create two permission groups: PG-John and PG-Peter. John should have full control
access to PG-John while Peter should have read-only access to PG-John. Similarly, Peter
should have full control access to PG-Peter while John should have read-only access to PGPeter.

John creates an initial header run using **PG-John** as the active permission group and routes it as needed. Peter now wants to branch from John's run. Peter sets **PG-Peter** as the active permission group and selects the header in John's run from which to branch. Instead of creating the header component (such as a tee), the software generates a **To Do List** item for John.

When John updates the out-of-date **To Do List** item, the software modifies the header to add the tee, and then generates a **To Do List** item for Peter.

When Peter updates his out-of-date **To Do List** item, the software fixes the branch leg (the end of the branch leg is adjusted to the tee port). This is called a double hand-shaking mechanism.

SECTION 2

Electrical Workflow

Before you begin routing cableways, duct banks, cable trays, conduits, and cables, you must define your reference data. Using the reference data workbooks, you can create custom parts for electrical modeling. Your first step should be to review, edit, and customize the delivered electrical reference data. For more information, see the *Electrical Reference Data Guide* available from the **Help > Printable Guides** command in the software.

After customizing the reference data, define the necessary electrical systems that you want in your model. You can create the systems in the Systems and Specifications task, or you can right-click the **System** tab in the **Workspace Explorer** to create systems.

After the electrical reference data and the needed systems are defined, you can begin routing cableways, cable trays, conduit, and duct banks in your model. You can divide a cable tray into purchasable lengths using **Insert Split**. To add equipment and cabinets, use **Place Equipment** within the Electrical task. You can then route conduit as needed. With the cableway and conduit systems are in place, you can route the cable in your model.

Electrical Common Tasks

The following tasks are used frequently in the Electrical task.

Customize Reference Data

Create new electrical reference data by editing the **CableTray.xls**, **Ductbank.xls**, **CableWay.xls**, **Conduit.xls**, and **Cabling.xls**, workbooks. For more information, see the *Electrical Reference Data Guide* available from the **Help > Printable Guides** command in the software.

Route Cableway, Duct Bank, and Cable Tray

To route cableways cable trays, or a duct banks in the model, see *Create new cableway* (on page 42).

After routing cable tray, you can split it into purchasable lengths. For more information, see *Insert multiple cable tray split* (on page 242) and *Insert a single cable tray split* (on page 244).

Route Conduit

Route conduit from the cable trays. For more information, see Create new conduit (on page 97).

Place Equipment

Use the **Place Equipment** command in the Electrical task or in the Equipment and Furnishings task to place equipment and cabinets in the model. For more information, see *Place equipment from the catalog* (on page 197).

Create Cable

Place cables in the model. For more information, see Create a cable (on page 214).

Route Cables

Route the cables that are in the model. For more information, see *Edit cable path manually* (on page 224).

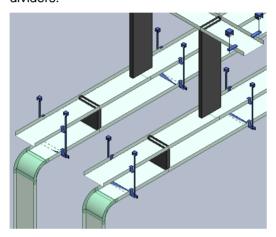
Change Properties

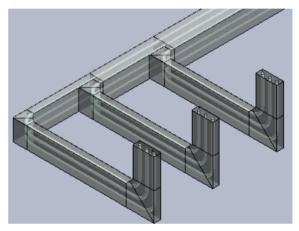
To change properties for a selected object, like a feature or run, click the **Properties** button on the horizontal ribbon bar. From there you can change the parent system, the run name, the specifications, and the properties associated with the tray run.

SECTION 3

Route Cableway

Creates, models, and extends cableway, duct bank, and cable tray precisely. Cableway is a logical object and does not have any physical parts, whereas cable tray and duct bank have physical parts. A cableway is used to reserve space for cable tray and cable in the model. A duct bank is a casing that encloses conduit runs. The enclosing run becomes a cableway, whereas the enclosed conduit runs have physical parts. You can route multiple, parallel cableway or cable trays at the same time. You can also place cable trays with barriers or dividers.





By default, the software uses fast mode routing, which means that you do not see elbow or turn graphics during the dynamic display. After you define the run location, the software displays the elbows. Press SHIFT+F toggle fast mode on and off.

Route Cableway Ribbon

Sets options for routing a cableway. The ribbon displays different options based on the feature shape, such as rectangular, flat oval, and round.

Properties

Displays the **Cableway Settings** dialog box. For more information, see *Cableway Settings Dialog Box* (on page 56).

Start Route

Specifies the route starting location.

Mark End Route

Specifies the route terminating location.

💥 Plane

Sets the working plane for the route path. The icon in the ribbon changes depending on your selection. The options include:

Plan Plane

Defines the work surface as the XY plane at the depth of the active end. You also can press CTRL+1 to select this option.

Elevation Plane: East-West (Z Plane: X-Axis)

Defines the work surface as the XZ plane. You also can press CTRL+2 to select this option.

■ Elevation Plane: North-South (Z Plane: Y-Axis)

Defines the work surface as the YZ plane. You also can press CTRL+3 to select this option.

Plane by Turn/Branch

Defines the work surface as the plane defined by an existing turn or branch. You select the turn or branch to set the plane. You also can press CTRL+4 to select this option.

Plane by Three Points

Defines the work surface using three points that you define. You also can press CTRL+5 to select this option.

X No Plane

Clears any work surfaces. The software does not project points that you place to any plane. You also can press CTRL+6 to select this option.

Run

Displays the existing cableways in the model along with the <New Cableway>, <New/Continue Run>, <Select Graphically>, and More options. Select the run to route.

- New Cableway> Displays the New Cableway dialog box. Use this option to create a new cableway. If a new cableway is created, all runs associated with the system parent selected on the New Cableway dialog box display in the list.
- New/Continue Run> Extends an existing cableway if you select the end feature of that cableway. If a run is continued, all runs associated with the system parent of the continued run display in the list. If you do not select an end feature, the New Cableway dialog box is displayed to create a cableway. For more information, see New Cableway Dialog Box (on page 61).
- <Select Graphically> Selects an existing cableway in a graphic view, or in the Workspace Explorer.
- More Displays the Select Cableway dialog box. Use this option to select a cableway
 that is associated with a different system parent. For more information, see Select
 Cableway Dialog Box (on page 70).

Shape

Sets the offset cross section shape. If you change the cross-section shape while routing, the software automatically converts the size, based on an equal area method. Formulas include:

- $A = \pi r^2$ Area of a circular shape. In this equation, *r* represents the radius of the circle.
- A = a * b Area of a rectangular shape. In this equation, a represents the rectangle width, and b represents the rectangle depth.

• $A = (\pi b^2/4) + b(a - b)$ - Area of a flat oval shape. In this equation, a represents the major dimension, and b represents the minor dimension.

Diameter

Sets the diameter of the cross section.

Width

Sets the width of the cross section. The list of options is determined by the values available in the reference data. The list displays only the values that are valid for the current depth. If the depth is not defined, or the **Depth** box is empty, the width size is based on the default width ratio. This option is available only if you have selected **Rectangle** or **Flat Oval** in the **Shape** box.

Depth

Sets the depth of the cross section. The list of options is determined by the values available in the reference data. The list displays only the values that are valid for the current width. If the width is not defined, or the **Width** box is empty, the depth size is based on the default width ratio. This option is available only if you have selected **Rectangle** or **Flat Oval** in the **Shape** box.

Orientation

Determines the orientation of the cross section. You can orient the cross section in a standard or skewed position, and you can specify the location of a cross section in the cableway. **Orientation** changes the local axis (U or V) of the cableway associated with the width axis of the offset cross section.

★ IMPORTANT You cannot access the orientation if an end feature or nozzle is selected to position the offset. This action fixes the orientation of both ends of the transition.

3 Angle Lock

Locks or unlocks the Angle box.

Angle

Enter or select an angle for the current route segment. You can enter any value needed, provided it does not conflict with the defined specifications. If the **Angle Lock** is unlocked, this box dynamically displays the bend angle of the cableway as you route.

Length Lock

Locks or unlocks the **Length** box.

Length

Enter or select a length for the current route segment.

Offset

Displays an offset of the part surface from the working plane.

😘 Lock Slope

Locks or unlocks the **Slope** box. This option is only available for duct banks.

Slope

Displays the current slope for the duct bank run. This option is only available for duct banks. Select **Not Sloped** to route with no slope. If you unlock the slope box, then the slope value

is matched to the slope of the duct run being routed.

TIP You can change the units of measure for the slope using Tools > Options > Units of Measure.

Edit Cableway Along Leg Feature Ribbon

Displays options for editing a cableway along leg feature.

Properties

Displays the **Cableway Along Leg Feature Properties** dialog box. For more information, see *Cableway Along Leg Feature Properties Dialog Box* (on page 71).

Move From

Click to specify the starting location of the move vector. If you do not define a starting point, the software assumes that the current location of the object is the starting point.

Move To

Click to specify the ending location of the move vector.

Run

Specifies the name of the cableway run. You can select a different run from the recently used runs that are listed or select **More** to select a different cableway in the workspace or database.

Part

Displays the part description.

Direction

This option is not available for this release.

Angle 1

Specifies the branch angle of the along leg feature. We recommend that you do not edit this angle if the along leg feature ends with a free leg.

Angle 2

Specifies the branch angle of the feature located at the other end of the branch. This box is blank if the branch is a free leg.

Edit Cableway End Feature Ribbon

Displays options for editing a cableway end feature.

Properties

Displays the **Cableway End Feature Properties** dialog box. For more information, see *Cableway End Feature Properties Dialog Box* (on page 73).

Move From

Click to specify the starting location of the move vector. If you do not define a starting point, the software assumes that the current location of the object is the starting point.

Move To

Click to specify the ending location of the move vector.

NOTE When you move or modify a route object in HVAC, Electrical, or Piping, Smart 3D treats any unfinished ends as free end features. An unfinished end is an end with mating parts or a logical data connection with one logical port. You can reconnect using these free end features. This behavior allows you to reuse existing mating parts and connections and reduces wait times.

Plane

Sets a working plane for the route path. Six options are available:

Plan Plane

Defines the work surface as the XY plane at the depth of the active end. You also can press CTRL+1 to select this option.

Elevation Plane: East-West (Z Plane: X-Axis)

Defines the work surface as the XZ plane. You also can press CTRL+2 to select this option.

■ ■ Elevation Plane: North-South (Z Plane: Y-Axis)

Defines the work surface as the YZ plane. You also can press CTRL+3 to select this option.

Plane by Turn/Branch

Defines the work surface as the plane defined by an existing turn or branch. You select the turn or branch to set the plane. You also can press CTRL+4 to select this option.

Plane by Three Points

Defines the work surface using three points that you define. You also can press CTRL+5 to select this option.

X No Plane

Clears any work surfaces. The software does not project points that you place to any plane. You also can press CTRL+6 to select this option.

Run

Displays the name of the cableway. Another cableway can be selected if needed. Select **More** to select a different cableway in the workspace or database.

Part

Allows you to specify the part associated with the end feature.

3 Angle Lock

Locks or unlocks the Angle box.

Leg Angle

Displays the angle of any turn or branch component that is located at the other end of the leg with which the selected end feature is associated. This box is disabled if no turn or branch exists at the other end of the leg. Changing the angle value adjusts the position of the selected end feature to achieve the specified angle and then locks that angle value. Unlock to dynamically update the angle as you move the selected end component.

1 Length Lock

Locks or unlocks the Length box.

Length

Displays the length of the cableway connected to the end being edited. Entering a value in this box adjusts the position of the selected end feature to achieve the specified length and then locks that length value. Unlock to dynamically update the length value as you move the selected end component.

Offset

Controls the SmartSketch® offset constraint. Type a distance that you want to offset the cableway. Select **<Disabled>** if you do not want to use the offset. Select **Set Offset Reference** to define a reference point. For more information on setting the reference point, see *Set Offset Reference Dialog Box (Cableway)* (on page 51).

Edit Cableway Straight Feature Ribbon

Displays options for editing a cableway straight feature.

Properties

Displays the **Cableway Straight Feature Properties** dialog box. For more information, see *Cableway Straight Feature Properties Dialog Box* (on page 77).

Move From

Click to specify the starting location of the move vector. If you do not define a starting point, the software assumes that the current location of the object is the starting point.

Move To

Click to specify the ending location of the move vector.

Plane

Activates options for selecting a working plane for the route path. Six options are available:

■ <> Plan Plane

Defines the work surface as the XY plane at the depth of the active end. You also can press CTRL+1 to select this option.

Elevation Plane: East-West (Z Plane: X-Axis)

Defines the work surface as the XZ plane. You also can press CTRL+2 to select this option.

■ Use Elevation Plane: North-South (Z Plane: Y-Axis)

Defines the work surface as the YZ plane. You also can press CTRL+3 to select this option.

Plane by Turn/Branch

Defines the work surface as the plane defined by an existing turn or branch. You select the turn or branch to set the plane. You also can press CTRL+4 to select this option.

Plane by Three Points

Defines the work surface using three points that you define. You also can press

CTRL+5 to select this option.

X No Plane

Clears any work surfaces. The software does not project points that you place to any plane. You also can press CTRL+6 to select this option.

Run

Displays the name of the cableway. Another cableway can be selected if needed. Select **More** to select a different cableway in the workspace or database.

Shape

Sets the offset cross-section shape. This option displays the current value if an end feature is selected to position the offset because this fixes the cross section shape and the size of the offset cross section.

Diameter

Sets the diameter of the cross section. This option is available only if you have selected **Round** in the **Shape** box.

Width

Sets the width dimension of the cross section. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current depth. If the depth is not defined, or the **Depth** box is empty, the width size is based on the default width ratio. This option is available only if you have selected **Rectangle** or **Flat Oval** in the **Shape** box.

Depth

Sets the depth of the cross section. The list of options is determined by the values available in the reference data. The list displays only the values that are valid for the current width. If the width is not defined, or the **Width** box is empty, the depth is set based on the default width ratio. This option is available only if you have selected **Rectangle** or **Flat Oval** in the **Shape** box.

Orientation

Determines the orientation of the cross section.

Lock Length

Locks or unlocks the **Length** box.

You can use the **Lock Length** button when moving features. When leg length is locked during the move of a straight feature, the software automatically modifies the turn points, along with the length and angle of adjacent straight features, to remain connected to the moved leg.

When leg length is not locked during the move of a straight feature, the software extends or shortens the associated legs to connect with the new position of the moved leg.

Offset

Controls the SmartSketch® offset constraint. Type a distance that you want to offset the cableway. Select **<Disabled>** if you do not want to use the offset. Select **Set Offset Reference** to define the reference point. For more information on setting the reference point, see *Set Offset Reference Dialog Box (Cableway)* (on page 51).

Max Fill

Displays the percent maximum fill of the cableway straight feature. This button is enabled only if the cable tray contains a cable. Click **Max Fill** to highlight the straight feature with the displayed maximum cable fill value in the model.

Edit Cableway Turn Feature Ribbon

Displays options for editing a cableway turn feature.

Properties

Displays the **Cableway Turn Feature Properties** dialog box. For more information, see *Cableway Turn Feature Properties Dialog Box* (on page 82).

Move From

Click to specify the starting location of the move vector. If you do not define a starting point, the software assumes that the current location of the object is the starting point.

Move To

Click to specify the ending location of the move vector.

Plane

Activates options for selecting a working plane for the route path. Six options are available:

Plan Plane

Defines the work surface as the XY plane at the depth of the active end. You also can press CTRL+1 to select this option.

Elevation Plane: East-West (Z Plane: X-Axis)

Defines the work surface as the XZ plane. You also can press CTRL+2 to select this option.

Elevation Plane: North-South (Z Plane: Y-Axis)

Defines the work surface as the YZ plane. You also can press CTRL+3 to select this option.

Plane by Turn/Branch

Defines the work surface as the plane defined by an existing turn or branch. You select the turn or branch to set the plane. You also can press CTRL+4 to select this option.

Plane by Three Points

Defines the work surface using three points that you define. You also can press CTRL+5 to select this option.

X No Plane

Clears any work surfaces. The software does not project points that you place to any plane. You also can press CTRL+6 to select this option.

Run

Displays the name of the cableway. Another cableway can be selected if needed. Select **More** to select a different cableway in the workspace or database.

Type

Specifies the short code associated with the selected turn. You can replace the existing turn feature with the available turn types displayed on the list. This list displays applicable turn types based on the nominal diameter of the selected object.

Miters

Specifies the number of miters for the turn feature. This option is available only if you select the Miter turn type from the Type list.

😘 Angle Lock

Locks or unlocks the angle. Locking the corresponding angle value creates a constraint along which the selected turn angle can be moved.

Angle 2

Specifies the angle of the turn feature located at the end of one associated leg. This option is disabled if there is no turn feature located at the end of the leg. Although this value can be changed, the location of the corresponding turn cannot. Modification of this value repositions the selected turn until the specified angle is achieved.

Angle 1

Specifies the angle of the turn that you are editing. Modification of this value repositions the selected turn until the specified angle is achieved.

Angle 3

Specifies the angle of the turn feature located at the end of one associated leg. This option is disabled if there is no turn feature located at the end of the leg. Although this value can be changed, the location of the corresponding turn cannot. Modification of this value repositions the selected turn until the specified angle is achieved.

Offset

Controls the SmartSketch offset constraint. Type a distance that you want to offset the cableway. Select <Disabled> if you do not want to use the offset. Select Set Offset Reference to define a reference point. For more information on setting the reference point, see Set Offset Reference Dialog Box (Cableway) (on page 51).

Routing Cableways and Cable Trays

A cableway reserves space in the model and does not contain physical parts. Cable travs do contain physical parts. You can also route multiple, parallel cableway or cable trays at the same time. Cable trays can be placed with or without barriers or dividers.

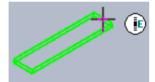
What do you want to do?

- Create new cableway (on page 42)
- Route stacked cableways (on page 53)
- Route side-by-side cableways (on page 54)
- Place components while routing cableway (on page 43)
- Route cableway with an offset (on page 44)

- Branch cableway from a turn feature (on page 45)
- Move a cableway branch (on page 139)
- Move a transition (on page 142)
- Flip a routed cableway tee (on page 48)
- Define cable tray barriers (on page 49)

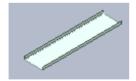
Create new cableway

- 1. Click Route Cableway 7.
- 2. Select a starting point in the graphic view for the new cableway.
 - TIP If you select a feature located at the end of an existing run, the software continues the run of the selected feature. Skip to step 5.
- 3. On the New Cableway Dialog Box (on page 61), specify the necessary properties for the cableway.
 - Define settings for cableway (on page 49)
- 4. Click **OK** to close the dialog box.
- 5. Select points to define the route of your cableway.



TIPS

- You can use PinPoint, Point Along, and the SmartSketch3D relationship indicators when defining your cableway.
- Using the Angle and Length constraints, you can lock these parameters while routing a cableway.
- 6. Right-click to end routing cableway.



■ NOTE If you select an end feature before starting Route Cableway, that feature is the default starting point for the new cableway.

Place components while routing cableway

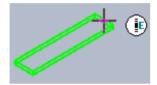
- 1. Click Route Cableway 7.
- 2. Select the run starting point.

TIP If you select a feature located at the end of an existing run, the software continues the run of the selected feature. Skip to step 5.

3. On the New Cableway Dialog Box (on page 61), specify necessary properties for the conduit.

Define settings for cableway (on page 49)

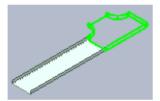
- 4. Click **OK** to close the dialog box.
- 5. Select points to begin routing your cableway.



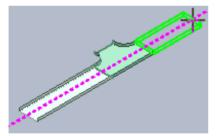
6. Click Insert Component 7.



7. On the ribbon, select a component type from Part box.



8. Click Finish.



9. Continue routing the cableway.

NOTE You can continue routing an existing run by selecting a run end feature or by selecting the run name from the list of available runs.

Route cableway with an offset

- 1. Click Route Cableway 7.
- 2. Select the run starting point.
- 3. Define the cableway properties on the *New Cableway Dialog Box* (on page 61), and then click **OK**.
- 4. From the Offset option, select Set Offset Reference.

The software displays the Set Offset Reference dialog box.

- 5. Select External for the offset type.
- 6. Select a reference from which you want to measure the offset.
- 7. Key in the offset distance in the **Offset** box.
- 8. Route the cableway as needed.

Copy a cableway run

- 1. Click Select &.
- 2. Select Cableways in the Locate Filter box.
- 3. Select the cableway run to copy.
- 4. Click Edit > Copy.
- 5. Select a reference point by clicking a point on the selected cableway.
- 6. Click Edit > Paste.
- 7. Select necessary options in the Paste dialog box.
 - NOTE Select the **Paste in place** option to copy the clipboard contents on top of the existing copied objects.
- 8. If you selected the **Paste in place** option, select **Move** \$\phi\$ from the main ribbon.
- 9. Identify a location in the model for the cableway run, and click in the graphic view to move the run to a new location.

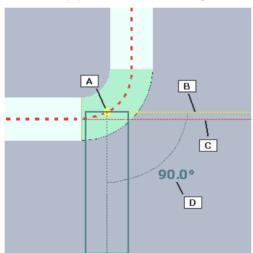
NOTE If you position an end of the copied cableway run so that it touches a cableway run end or nozzle, the software automatically connects the two.

Branch cableway from a turn feature

- 1. Click Route Cableway
- 2. Select a cableway or cable tray turn feature in the model.
 - **NOTE** From the point that you click on the turn feature, the software finds the closest point on the centerline. This point is the branch point.
- 3. On the New Cableway Dialog Box (on page 61), select Cws-0 in the Specification box.
- 4. Specify the other properties as needed.
- 5. Click **OK**, and route the cableway.

■ NOTES

- Because zero-spec cableway is being routed, the software does not create any parts for the new cableway or its connection to the existing cableway or cable tray.
- The branch angle is determined by translating the centerline of the connected leg closest to the branch point. The picture below shows the branch point (A), a reference line (B), the centerline (C) of the connected leg, and the resulting branch angle (D).



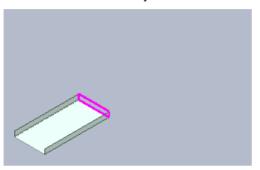
Branch cableway from a conduit end feature

- 1. Click Route Cableway 7.
- 2. Select the end feature of a conduit.
 - TIP From the point that you click on the end feature, the software finds the closest point on the centerline. This point is the branch point.
- 3. On the New Cableway Dialog Box (on page 61), select Cws-0 in the Specification box.
- 4. Specify the other properties as needed, and then click **OK**.
- Continue routing the cableway.
- NOTE The software does not create any parts for the zero-spec cableway. The software only supports the branching of a cableway specification run from conduit end features. If you try

to branch from conduit features other than conduit end features, the software treats it as routing from free space and does not create any branch features.

Extend existing cableway

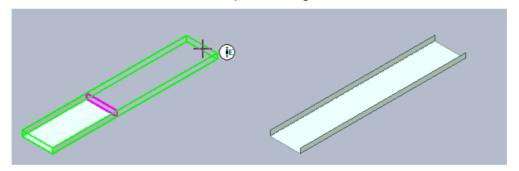
- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the end that you want to move.
 - TIP Make sure that you select the end feature.



- 4. Click **Move To**

 on the ribbon. If you do not define a starting point by using **Move From**on the software assumes that the current location of the object is the starting point.
- 5. Move the cableway end to the new location. You can use the **Length** box to type a new length for the cableway.

The software extends the end to the specified length.



Flip a cableway part while routing

- 1. Click Insert Component 7.
- 2. Select a straight feature, end feature, nozzle, or component port to designate the insertion point of the component.
- 3. In the Part box, click one of the parts listed, or click More.
- Select a part from the catalog, and then click **OK**.
 The software places an outline of the selected part.
- 5. On the ribbon bar, click the arrow adjacent to Flip NM, and then select a port from the list.

The selected port is the new insertion point, and the part flips corresponding to the selected port.

- 6. Click Finish.
- 7. Continue routing the cableway.

NOTE You can continue routing an existing run by selecting a run end feature or by selecting the run name from the list of available runs.

Modify multiple cableway cross section sizes

- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the features that you want to edit.
- 4. Click **Properties** on the ribbon.
- 5. On the **Properties** dialog box, click the **Cross Section** tab.
 - TIP If the dialog box does not have a **Cross Section** tab, you cannot edit the cross section for that type of feature.
- 6. Edit the width, depth, and orientation angle values to meet your requirements. You can also change the cross section shape.

TIPS

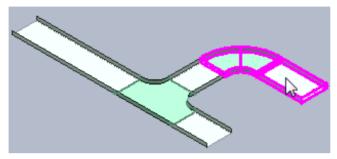
- Cross section shapes include Rectangle, Round, and Flat Oval.
- Manually placed components will not update with the system generated features. You
 must replace these components manually.
- 7. To end the modification, right-click in the graphic view or click **Select** .

Modify cableway feature cross section shape

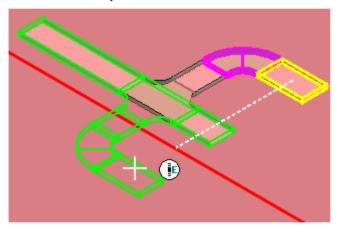
- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the feature that you want to edit.
- 4. Click **Properties** on the ribbon.
- 5. On the **Properties** dialog box, click the **Cross Section** tab.
 - TIP If the dialog box does not have a **Cross Section** tab, you cannot edit the cross section for that type of feature.
- 6. Select an available shape from the Cross Section list.
 - **NOTE** When you change a cross section shape, the software immediately updates the database.
- 7. If needed, edit the dimensions.
- 8. To end the modification, right-click in a graphic view or click **Select** \(\hat{\gamma} \).

Flip a routed cableway tee

- 1. Click Select .
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the cableway features connected to the tee, excluding the first feature.

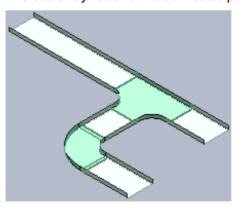


- 4. On the ribbon bar, click Move.
- 5. Select a cableway feature.



6. Move the features to a new location in the opposite direction.

The cableway tee and the connected parts flip accordingly.



Choose a working plane

1. On the ribbon, click **Plane** * and select your working surface.

Plane Ribbon Options

- Plan Plane Defines the work surface as the XY plane at the depth of the active end. You also can press CTRL+1 to select this option.
- Elevation Plane: East-West Defines the work surface as the XZ plane. You also can press CTRL+2 to select this option.
- Elevation Plane: North-South Defines the work surface as the YZ plane. You also can press CTRL+3 to select this option.
- Plane by Turn/Branch Defines the work surface as the plane defined by an existing turn or branch. You select the turn or branch to set the plane. You also can press CTRL+4 to select this option.
- Plane by Three Points Defines the work surface using three points that you define. You also can press CTRL+5 to select this option.
- No Plane Clears any work surfaces. The software does not project points that you place to any plane. You also can press CTRL+6 to select this option.

Define settings for cableway

- 1. On the **General** tab of the **New Cableway** dialog box, choose the system for the cableway in the **System** box.
 - TIP The **System** box lists up to the last ten selected systems. Select **More** to browse all systems in the workspace and database.
- 2. In the **Cableway** box, type the name of the new cableway that you are creating. If you do not enter a name, the software generates a name using the default naming rule.
 - TIP You can choose a naming rule in the Name Rule box, if necessary.
- 3. Set the specification of the new cableway in the **Specification** box.
- **NOTE** Use the **Category** option to view more properties that you can set for the cableway.

Define cable tray barriers

- ★ IMPORTANT You need to bulkload the Cable Tray Barrier Parts workbook delivered to [Product Folder]\CatalogData\BulkLoad\SampleDataFiles. You can also modify a relevant workbook to support barriers.
- 1. Click Route Cableway 7.
- 2. Click in the model to select a starting location for the cableway.
 - The software displays the New Cableway Dialog Box (on page 61).
- 3. On the **General** tab, specify all the required properties.
 - **NOTE** You must select a specification that supports barriers.
- 4. Type a number in the **Number of Barriers** box. The default value is **0**.

The software adds a new tab to the dialog box called **Barriers**.

- 5. On the Barriers tab, select the <CableWay Properties>, and make your changes.
- 6. Repeat for each of the **<CableWay Properties>** that needs modifying.
- 7. Click OK.

The software adds a barrier by dividing the right-most partition into equal parts.

TIP If you want all partitions to be equal, click Go to Defaults 🖒.

See Also

Modify cable tray barriers (on page 50)

Modify cable tray barriers

- 1. Click Select .
- 2. Select Enclosing Runs in the Locate Filter box.
- 3. Select the cable tray to modify.
- 4. On the **Barriers** tab, click **Add Barrier** to add another barrier.
- 5. Click **OK** to confirm the modification.

The software adds a barrier by dividing the right-most partition into equal parts.

TIPS

- If you want all partitions to be equal, click Go to Defaults .
- To delete a partition, click **Delete** X.

Select cableway cross section properties

- 1. Click **Properties** while you are routing cableway.
- 2. On the Cableway Settings dialog box (on page 56), click the Cross Section tab.
- 3. On the **Cross Section** tab, select the shape of cross section from the list. You can select from rectangular, round, and flat oval.
- 4. If necessary, specify the dimensions of the new cross-section.
- **NOTE** You can also specify cross-section properties in the **Shape** box on the ribbon.

Set Offset Reference Dialog Box (Cableway)

Sets options for reference offsets while routing cableway.

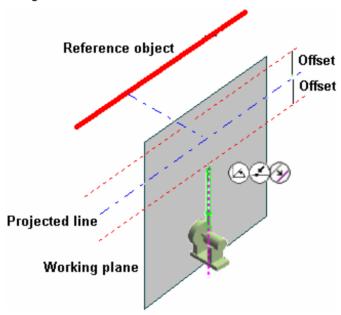
Offset Reference Type

Specifies the offset type for the cableway.

- External Routes a cableway at a specified distance from another object, such as another cableway running parallel to the one you are placing.
- Cardinal Point Routes a cableway by the top, sides, bottom, or invert elevation of the
 cableway instead of the cableway centerline. You must use Tools > PinPoint and lock
 the plane when using this reference type. For example, if you are routing the cableway
 by the invert elevation cardinal point, you must lock the elevation plane at the invert
 elevation you want to use.

If the referenced object is a planar surface (such as a slab or deck), then the offset distance is measured from the surface to the selected reference plane (for example, the Elevation Plane: East-West (Z Plane: X-axis).

If the referenced object is a linear element (such as a structural beam), then the offset distance is measured from the line to the selected reference plane on which the cableway is being routed.



Offset

Controls the SmartSketch3D offset constraint. Type the distance that you want to offset. You can turn off the offset option by selecting **<Disabled>**.

Measured From

Specifies the object from which you want to measure the offset. You can select:

 Centerline - Select this option if you want to measure the offset from the centerline of a cableway.

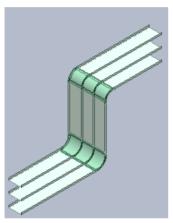
- Surface by width Select this option if you want to measure the offset from the width dimension of the cableway.
- Surface by depth Select this option if you want to measure from the depth dimension of the cableway.

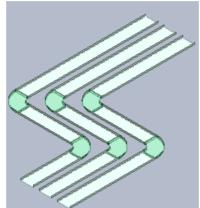
See Also

Create New Cableway (on page 42)
Route Cableway with an Offset (on page 44)
Route stacked cableways (on page 53)

Route Multiple, Parallel Cableway Runs

You can route multiple, parallel cableway or cable tray runs in either **Along Depth** (stacked) or **Along Width** (side-by-side) mode.





To route multiple, parallel cableway runs, use **Route Cableway** and set options as needed on the *Multi-Route Tab (New Cableway Dialog Box)* (on page 64). The software creates a master run and several slave runs. When you route the master run, the slave runs follow along. You can specify the number of slave runs above and below or to the left and right of the master run.

After the cableways are routed in the model, they are individual cableway runs without relationships to each other. For example, you can change a property on the master run and it does not affect any of the slave runs.

NOTE The **Multi-Route** tab is not available when a Duct Bank specification has been selected on the **General** tab.

What do you want to do?

- Route stacked cableways (on page 53)
- Route side-by-side cableways (on page 54)

Route stacked cableways

- 1. Click Route Cableway 7.
- 2. Select a starting point in the graphic view for the new cableways.

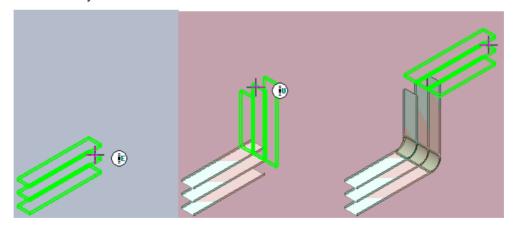
The software displays the New Cableway Dialog Box (on page 61).

- 3. On the **General** tab, specify the settings for the cableway.
 - Define settings for cableway (on page 49)
- 4. Select the Multi-Route tab to specify the settings for multi-routing.
- 5. Select Along Depth in the Mode box to create stacked cableways.
- 6. In the **Cableways Above Master Run** box, enter the number of cableways that you want above the master cableway.
- 7. In the **Cableways Below Master Run** box, enter the number of cableways that you want below the master cableway.
- 8. In the **Vertical Distance Between Trays** box, enter the distance between the cableway runs.
- 9. Click **OK** to close the dialog box.
- 10. Click in a graphic view define the route of your cableway.

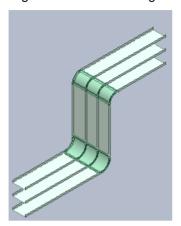
As you click, the software places the master cableway, and the slave runs follow along.

TIPS

- You can use **PinPoint** ♣ Point Along ☑, and the SmartSketch3D relationship indicators when defining your cableways.
- Using the Angle and Length constraints, you can lock these parameters while routing a cableway.



11. Right-click to end routing of the cableways.



Route side-by-side cableways

- 1. Click Route Cableway 7.
- 2. Select a starting point in the graphic view for the new cableways.

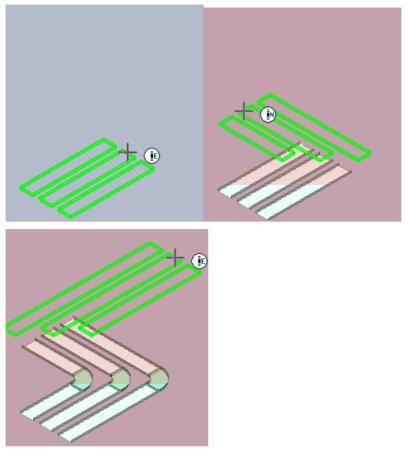
The software displays the New Cableway Dialog Box (on page 61).

- 3. On the **General** tab, specify the settings for the cableway.
 - Define settings for cableway (on page 49)
- 4. Click the Multi-Route tab to specify the settings for multi-routing.
- 5. Select **Along Width** in the **Mode** box to create side-by-side cableways.
- 6. In the **Cableways to Left of Master Run** box, enter the number of cableways that you want to the left of the master cableway.
- 7. In the **Cableways to Right of Master Run** box, enter the number of cableways that you want to the right of the master cableway.
- 8. In the **Horizontal Distance Between Trays** box, enter the distance between the cableway
- 9. Click **OK** to close the dialog box.
- 10. Click in a graphic view to define the route of your cableway.

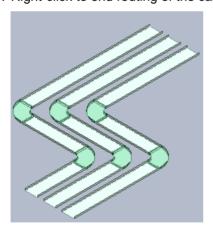
As you click, the software places the master cableway, and the slave runs follow along.

TIPS

- You can use PinPoint Point Along and the SmartSketch3D relationship indicators when defining your cableways.
- Using the Angle and Length constraints, you can lock these parameters while routing a cableway.



11. Right-click to end routing of the cableways.



Cableway Settings Dialog Box

Sets options for a cableway while you are routing.

See Also

Cross Section Tab (Cableway Settings Dialog Box) (on page 59) Defaults Tab (Cableway Settings Dialog Box) (on page 60) General Tab (Cableway Properties Dialog Box) (on page 73) General Tab (Cableway Settings Dialog Box) (on page 56)

General Tab (Cableway Settings Dialog Box)

Displays the general properties of the cableway that you are routing.

NOTE Because cableway run properties are customizable in the reference data, only the properties that are required by the software are documented.

Cableway properties are divided into several different categories: **Standard**, **Surface Treatment and Coating**, **Cable Fill**, **Maintenance Volume**, and **Responsibility**. You select which category that you want to define values for by using the **Category** option.

Standard

System

Displays or defines the system for the cableway. The last system that you selected is the default. Select **More** to display all defined systems. You can create a new system in the Systems and Specifications task.

Cableway

Displays or defines the name of the cableway that you are creating.

Specification

Displays or defines the specification for the cableway. Specifications are assigned to systems in the Systems and Specifications task. Only those specifications that are allowed in the system that you selected appear. You define specifications in the reference data.

For more information on defining specifications, see the *Electrical Reference Data Guide*, available from the **Help > Printable Guides** command in the software.

Surface Treatment and Coating

Interior Coating Requirement

Specifies the interior coating requirement for the object. To change the options on the list, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Interior Coating Type

Specifies the type of interior coating for the object. To change the options on the list, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Interior Coating Area

Specifies the area of the interior coating for the object.

Exterior Coating Requirement

Specifies the coating requirement for the object. To change the options on the list, edit the **Coating Type** select list in Catalog.

Exterior Coating Type

Specifies the type of coating for the object. To change the options on the list, edit the **Coating Type** select list in Catalog.

Exterior Coating Area

Specifies the area of the coating for the object.

Coating Color

Specifies the color of the object coating. To change the options on the list, edit the **Coating Color** select list in Catalog. Smart 3D includes this property in the painting area report.

Cable Fill

Fill Efficiency

Specifies the efficiency of the stacking of cables in the cableway. Type a real number, integer, or percent. For example, type 0.9, 90, or 90%.

Signal Type

Specifies the cable usage, which Smart 3D uses in tray fill calculations. To change the options on the list, edit the **Signal Type** select list in Catalog.

Voltage Grade

Specifies the voltage grade, which Smart 3D uses when determining the range of voltage that the cableway can carry. To change the options on the list, edit the **Voltage Grade** select list in Catalog.

Maintenance Volume

A maintenance volume is space reserved for installing and maintaining cables in a cable tray and can be defined at the cableway level and optionally overridden at the feature level. You can also define maintenance volumes for duct banks to reserve space for a mud mat below the duct bank. Use the **Format > View** command to turn on the **Maintenance** aspect so you can see the maintenance volumes in the model.

Maintenance Volume Properties Option

Select **Use Run Properties** to use the maintenance volume properties defined for the parent run. Select **Default Feature Properties** to define maintenance volume settings that are unique for this feature. This option is only available when editing the properties of a feature.

Maintenance Shape

Specifies the maintenance volume shape: Rectangle, Round, or Flat Oval.

Maintenance Diameter

Specifies the diameter of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Round**.

Maintenance Width

Specifies the width of the maintenance volume. This option is only available when

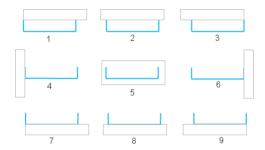
Maintenance Shape is set to Rectangle or Flat Oval.

Maintenance Depth

Specifies the depth of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Justification

Specifies how the maintenance volume (gray box below) aligns with the feature (blue cross section below). There are ten options available: (1) **Top Left**, (2) **Top Center**, (3) **Top Right**, (4) **Center Left**, (5) **Center Center**, (6) **Center Right**, (7) **Bottom Left**, (8) **Bottom Center**, (9) **Bottom Right**, and **User Defined**.



Maintenance Width Offset

Specifies the width offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Maintenance Depth Offset

Specifies the depth offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Responsibility

Cleaning Responsibility

Select the party responsible for cleaning the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Cleaning Responsibility** select list in the Catalog task.

Design Responsibility

Select the party responsible for designing the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Design Responsibility** select list in the Catalog task.

Fabrication Responsibility

Select the party responsible for fabricating the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Fabrication Responsibility** select list in the Catalog task.

Installation Responsibility

Select the party responsible for installing the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Installation Responsibility** select list in the Catalog task.

Painting Responsibility

Select the party responsible for painting the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Painting Responsibility** select list in the Catalog task.

Requisition Responsibility

Select the party responsible for ordering the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Requisition Responsibility** select list in the Catalog task.

Supply Responsibility

Select the party responsible for delivering the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Supply Responsibility** select list in the Catalog task.

Testing Responsibility

Select the party responsible for testing the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Testing Responsibility** select list in the Catalog task.

Cross Section Tab (Cableway Settings Dialog Box)

Displays and defines the cross section properties of the cableway.

Standard

Cross Section

Defines the shape of the cross section. You can select from rectangular, round, and flat oval. If the cross section is round, only one other property is available: **Diameter**.

Width

Sets the width dimension for rectangular and flat oval cross sections. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current depth. If the **Depth** box is blank, all widths listed in the current specification are shown.

Depth

Sets the depth of the cross section for rectangular and flat oval cross sections. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current width. If the **Width** box is blank, all depths listed in the current specification are shown.

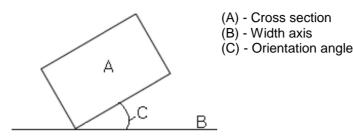
Diameter

Determines the diameter of round cross sections. Values stored in the reference data determine the list of options. You can also enter a value that is not on the list.

Orientation Angle

Sets an angle between the local axis associated with the cross section and the width axis. If the angle value is zero, the width is aligned with the local cross section axis.

The following picture shows the orientation angle (C).



Fill Information

Percent Fill

Displays or defines the percent cable fill in the cableway feature.

See Also

Modify Cableway Feature Cross Section Shape (on page 47) Modify Multiple Cableway Cross Section Sizes (on page 47)

Defaults Tab (Cableway Settings Dialog Box)

Provides detailed, algebraic measurements for the length of a transition and the radius of a turn.

Transition Length

Defines the length of the transition.

Turn Radius

Displays the throat radius and bend radius of the turn transition. A default value displays when the command is re-selected.

Turn Type

Allows you to select turn types, like **Bend, Miter**, and **Chamfer**, in addition to any other turn types that the run specification allows. If you change specifications to one with parts, the software overrides the type of turn that you have set and replaces it with the default turn type.

Remember Working Plane

Allows you to choose whether the software remembers the last used working plane. **False** clears the last selected plane so that you must reset the plane each time that you begin routing. **True** remembers the last used working plane. The software then remembers your selection and locks each route onto the plane. The default option is **False.**

When Remember Working Plane is set to False, the default plane option for Route Cableway is No Plane. Each time that you click a routing command, the system clears the last selected Plane option. You must reset the plane option each time that you begin a route.

However, you can set the default behavior to remember the last used working plane by setting **Remember Working Plane** to **True**. The software then locks the route onto the plane that you are using and remembers your selection within that session only.

NOTE This option is available when you are routing duct, piping, cableways, and conduits. Setting this option to **True** when you are in any of these tasks results in an automatic **True** setting for all tasks. Likewise, setting this option to **False** when you are in

any of these tasks results in an automatic False setting for all tasks.

New Cableway Dialog Box

Creates a new cableway run or duct bank in your model using properties that you specify. You can access the **New Cableway** dialog box by going to the Electrical task, selecting the **Route Cableway** command, and then selecting **<New Cableway>** from the **Run** option on the ribbon.

Standard

System

Displays or defines the system for the cableway. The last system that you selected is the default. Select **More** to display all defined systems. You can create a new system in the Systems and Specifications task.

Cableway

Displays or defines the name of the cableway that you are creating. The name is based on the **Name Rule** selection. If you want to type a new name for the run, in the **Name Rule** box, select **User Defined**, and then type a name for the run in the **Name** box.

Name Rule

Specify the naming rule that you want to use to name this run. You can select one of the listed rules or select **User Defined** to specify the run name yourself in the **Name** box.

Specification

Displays or defines the specification for the cableway. Specifications are assigned to systems in the Systems and Specifications task. Only those specifications that are allowed in the system that you selected appear. You define specifications in the reference data.

■ NOTE If you select the **DBS-0** specification, **Slope** option is displayed. If you select a specification that allows barriers, then the software displays the **Barriers** tab.

For more information on defining specifications, see the *Electrical Reference Data Guide*, available from the **Help > Printable Guides** command in the software.

Number of Barriers

Defines the number of barriers included in the cableway. If you select a specification that allows barriers and you define a number of barriers greater than zero, a **Barriers** tab appears.

Slope

Defines the slope for the duct bank. Enter a value to route a sloped duct bank, or select **Not Sloped** to route a duct bank without slope.

Surface Treatment and Coating

Interior Coating Requirement

Specifies the interior coating requirement for the object. To change the options on the list, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Interior Coating Type

Specifies the type of interior coating for the object. To change the options on the list, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Interior Coating Area

Specifies the area of the interior coating for the object.

Exterior Coating Requirement

Specifies the coating requirement for the object. To change the options on the list, edit the **Coating Type** select list in Catalog.

Exterior Coating Type

Specifies the type of coating for the object. To change the options on the list, edit the **Coating Type** select list in Catalog.

Exterior Coating Area

Specifies the area of the coating for the object.

Coating Color

Specifies the color of the object coating. To change the options on the list, edit the **Coating Color** select list in Catalog. Smart 3D includes this property in the painting area report.

Cable Fill

Fill Efficiency

Specifies the efficiency of the stacking of cables in the cableway. Type a real number, integer, or percent. For example, type 0.9, 90, or 90%.

Signal Type

Specifies the cable usage, which Smart 3D uses in tray fill calculations. To change the options on the list, edit the **Signal Type** select list in Catalog.

Voltage Grade

Specifies the voltage grade, which Smart 3D uses when determining the range of voltage that the cableway can carry. To change the options on the list, edit the **Voltage Grade** select list in Catalog.

Maintenance Volume

A maintenance volume is space reserved for installing and maintaining cables in a cable tray and can be defined at the cableway level and optionally overridden at the feature level. You can also define maintenance volumes for duct banks to reserve space for a mud mat below the duct bank. Use the **Format > View** command to turn on the **Maintenance** aspect so you can see the maintenance volumes in the model.

Maintenance Volume Properties Option

Select **Use Run Properties** to use the maintenance volume properties defined for the parent run. Select **Default Feature Properties** to define maintenance volume settings that are unique for this feature. This option is only available when editing the properties of a feature.

Maintenance Shape

Specifies the maintenance volume shape: Rectangle, Round, or Flat Oval.

Maintenance Diameter

Specifies the diameter of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Round**.

Maintenance Width

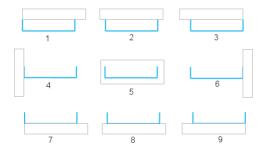
Specifies the width of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Depth

Specifies the depth of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Justification

Specifies how the maintenance volume (gray box below) aligns with the feature (blue cross section below). There are ten options available: (1) **Top Left**, (2) **Top Center**, (3) **Top Right**, (4) **Center Left**, (5) **Center Center**, (6) **Center Right**, (7) **Bottom Left**, (8) **Bottom Center**, (9) **Bottom Right**, and **User Defined**.



Maintenance Width Offset

Specifies the width offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Maintenance Depth Offset

Specifies the depth offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Responsibility

Cleaning Responsibility

Select the party responsible for cleaning the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Cleaning Responsibility** select list in the Catalog task.

Design Responsibility

Select the party responsible for designing the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Design Responsibility** select list in the Catalog task.

Fabrication Responsibility

Select the party responsible for fabricating the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Fabrication Responsibility** select list in the Catalog task.

Installation Responsibility

Select the party responsible for installing the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Installation Responsibility** select list in the Catalog task.

Painting Responsibility

Select the party responsible for painting the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Painting Responsibility** select list in the Catalog task.

Requisition Responsibility

Select the party responsible for ordering the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Requisition Responsibility** select list in the Catalog task.

Supply Responsibility

Select the party responsible for delivering the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Supply Responsibility** select list in the Catalog task.

Testing Responsibility

Select the party responsible for testing the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Testing Responsibility** select list in the Catalog task.

See Also

Create New Cableway (on page 42)

Multi-Route Tab (New Cableway Dialog Box) (on page 64)

Duct Bank Tab (New Cableway Dialog Box) (on page 65)

Barriers Tab (New Cableway Dialog Box) (on page 69)

Multi-Route Tab (New Cableway Dialog Box)

Displays and defines properties for routing multiple, parallel cableway systems.

Mode

Designates the mode of parallel routing: **Along Depth** or **Along Width**. The **Along Depth** mode creates stacked cableways, and the **Along Width** mode creates side-by-side cableways.

Along Depth Mode

Cableways Above Master Run

Type the number of cableways to be routed above the master run.

Cableways Below Master Run

Type the number of cableways to be routed below the master run.

Vertical Distance Between Trays

Type the vertical distance between the parallel cableways.

Modeling of Riser Sections

Specifies either constant spacing or constant leg length in riser sections. In the current version, this setting is **Maintain Constant Spacing** and cannot be changed.

Along Width Mode

Cableways to Left of Master Run

Type the number of cableways to be routed to the left of the master run.

Cableways to Right of Master Run

Type the number of cableways to be routed to the right of the master run.

Horizontal Distance Between Trays

Type the horizontal distance between the parallel cableways.

Modeling of Skewed Sections

Specifies either constant spacing or constant leg length in skewed sections. In the current version, this setting is **Maintain Constant Spacing** and cannot be changed.

See Also

Route Multiple, Parallel Cableway Runs (on page 52)

Duct Bank Tab (New Cableway Dialog Box)

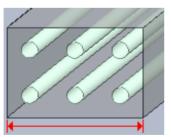
Displays and defines properties of duct bank systems. To route a duct bank, begin by selecting a duct Bank **Specification** on the **General** tab; that is, **DBS-0**.

Duct Bank Properties

Click Select Item for Modification > Duct Bank Properties to access the following properties:

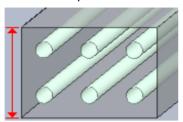
Duct Bank Width

Enter the width of the duct bank.



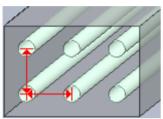
Duct Bank Depth

Enter the depth of the duct bank.



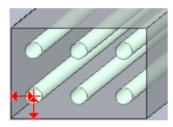
Conduit to Conduit distance

Enter the distance from center-point to center-point on the conduits.



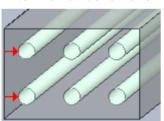
Edge to Conduit distance

Enter the distance from one edge of the duct bank to the conduit center point.



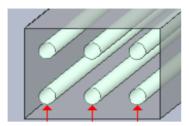
Number of Conduit rows

Enter the number of rows.



Number of Conduit columns

Enter the number of columns.



Default Conduit Specification

Enter the conduit type specification.

Default Conduit Diameter

Enter the diameter of the conduit.

Default Conduit Fill Efficiency

Displays or defines the efficiency of the stacking of cables in the conduit. You can enter a real number, integer, or percent; for example, type 0.9, 90, or 90%.

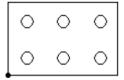
Default Conduit Signal Type

Displays or defines the cable usage, which is used in tray fill calculations. If you want to add, edit, or remove values that are available for selection, edit the **Signal Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Default Conduit Voltage Grade

Displays or defines the voltage grade, which is used in determining the range of voltage that the conduit can carry. If you want to add, edit, or remove values that are available for selection, edit the **Voltage Grade** sheet in the **AllCodeLists.xls** workbook in the reference data.

Preview



Shows the cross section of the duct bank. You can modify individual conduits by selecting the run number from the **Select Item for Modification** box.



Provides a visual cue for the XY orientation.

Resize

Validates the duct bank cross section properties and, if necessary, resizes the duct bank

cross section.

Delete Conduit Run

Deletes the selected conduit run from the duct bank cross section. This command is enabled only when editing a conduit run properties.

Go To Defaults

Resets all conduits to the default values.

Add Conduit Run

Adds a new conduit run.

Run N x N

Click **Select Item for Modification > Run NxN** to access the following properties:

Conduit Run

Select the parent conduit run for the selected conduit.

Conduit RunName

Accept the default name or enter a name for the conduit.

Conduit Spec

Select from the specs available in the options list.

Conduit Diameter

Select from the allowable diameters available in the **Options** list.

Distance Along Width Direction

Enter value to position the conduit in the X direction.

Distance Along Depth Direction

Enter value to position the conduit in the Y direction.

Row Number

Enter a new position for the conduit. If you enter a number that already holds a conduit, the conduits will "sit" on each other and you cannot readily see them. However, you can see this in Preview.

Column Number

Enter a new position for the conduit. If you enter a number that already holds a conduit, the conduits will "sit" on each other and you cannot readily see them. However, you can see this in Preview.

Fill Efficiency

Enter the percentage cable fill capacity of the conduit.

Signal Type

Select the signal type from the available options list.

Voltage Grade

Select the voltage grade from the available options list.

Barriers Tab (New Cableway Dialog Box)

Displays and defines properties of any barriers included in the cable tray. To display this dialog box, you must select the appropriate **Specification** and enter the **Number Of Barriers** on the **General** tab of the **New Cableway** dialog box.

Select Item for Modification

Select the partition created by the barrier that you want to modify. To assist you in locating the correct partition, the cableway symbol at the bottom of the dialog box highlights the partition selected.

Go to Defaults

Resets all partitions or cable trays to default settings.

X Delete Barrier

Deletes the selected barrier from the cable tray.

Add Barrier

Adds a new barrier to the cable tray.

<CableTray Properties>

Indicates that you are modifying the main cableway.

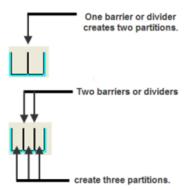
- CableTray Width Specifies the width of the entire cable tray.
- CableTray Depth Specifies the depth of the entire cable tray.
- Default Cableway Spec Specifies the specification to be used as the default.
- Default Minimum Cableway Barrier Width Specifies the minimum width value for the barrier/divider. The partitions are symmetrical until you change them.

<CableWay1 Properties>

Indicates that you are modifying the first new partition. Select **<CableWay2 Properties>** to select the second partition, and so forth.

- CableWay Run Select the cableway to which you want to attach this particular partition.
- CableWay Run Name Accept the default name or enter a name for the cableway run.
- Cableway Spec Displays the specification of the enclosing cableway. This option is read-only.
- Offset Along Width Direction You cannot change this value for Cableway 1.
 However, it can be modified for the other partitions.
- Fill Efficiency Specifies the percentage cable fill capacity for the partition.
- **Signal Type** Enter the signal type of the cable for this particular partition.
- Voltage Grade Enter the voltage grade of the cable for this particular partition.

Preview



Illustrates the number of barriers in the cable tray, and the number of resulting partitions. Additional highlighting appears when you select an item for modification. (See the red lines in the following illustration.)

The partitions are symmetrical in size until you change them.



X= Along Width Direction

Y= Along Depth Direction

Provides a visual cue for the XY orientation.

See Also

Define Cable Tray Barriers (on page 49)

Select Cableway Dialog Box

Displays all the cableways. Select a cableway from the hierarchy, and then click OK.

NOTE Look In options are currently only available for Quick Route 11.

Look In

Specifies that location in which you want to look for the cableway.

- Workspace Displays all cableways placed in the defined workspace only.
- Database Displays all of the cableways available in the entire model database.

See Also

Route Cableway (on page 33)

Cable Tray Component Properties Dialog Box

Displays cable tray component properties for review and editing.

See Also

Configuration Tab (on page 275)

Connections Tab (on page 277) Notes Tab (on page 277) Relationship Tab (on page 278)

Cable Tray Part Properties Dialog Box

Displays cable tray part properties for review and editing.

See Also

Configuration Tab (on page 275) Connections Tab (on page 277) Edit Cable Tray Part Properties (on page 161) Notes Tab (on page 277) Relationship Tab (on page 278)

Cableway Along Leg Feature Properties Dialog Box

Displays along-leg feature properties for review and editing.

See Also

Configuration Tab (on page 275)

Edit Cableway Along Leg Feature Properties (see "Edit cableway along-leg feature properties" on page 160)

General Tab (Cableway Along Leg Feature Properties Dialog Box) (on page 71) Relationship Tab (on page 278)

General Tab (Cableway Along Leg Feature Properties Dialog Box)

Displays and defines the general properties of the selected cableway along-leg feature.

Standard

Cableway

Identifies the name of the feature.

Specification

Determines the specification assigned to the feature.

Angle

Sets the angle of the along-leg feature.

Part

Allows you to select a part associated with the feature, if applicable.

Maintenance Volume

A maintenance volume is space reserved for installing and maintaining cables in a cable tray and can be defined at the cableway level and optionally overridden at the feature level. You can also define maintenance volumes for duct banks to reserve space for a mud mat below the duct bank. Use the **Format > View** command to turn on the **Maintenance** aspect so you can see the maintenance volumes in the model.

Maintenance Volume Properties Option

Select **Use Run Properties** to use the maintenance volume properties defined for the parent run. Select **Default Feature Properties** to define maintenance volume settings that are unique for this feature. This option is only available when editing the properties of a feature.

Maintenance Shape

Specifies the maintenance volume shape: Rectangle, Round, or Flat Oval.

Maintenance Diameter

Specifies the diameter of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Round**.

Maintenance Width

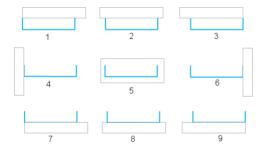
Specifies the width of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Depth

Specifies the depth of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Justification

Specifies how the maintenance volume (gray box below) aligns with the feature (blue cross section below). There are ten options available: (1) **Top Left**, (2) **Top Center**, (3) **Top Right**, (4) **Center Left**, (5) **Center Center**, (6) **Center Right**, (7) **Bottom Left**, (8) **Bottom Center**, (9) **Bottom Right**, and **User Defined**.



Maintenance Width Offset

Specifies the width offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Maintenance Depth Offset

Specifies the depth offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Fill Information

Percent Fill

Displays or defines the percent cable fill in the cableway feature.

See Also

Cableway Along Leg Feature Properties Dialog Box (on page 71)

Cableway End Feature Properties Dialog Box

Displays end feature properties for review and editing.

See Also

Configuration Tab (on page 275)

Edit Cableway End Feature Properties (on page 161)

General Tab (Cableway End Feature Properties Dialog Box) (on page 73)

Relationship Tab (on page 278)

General Tab (Cableway End Feature Properties Dialog Box)

Displays and defines the general properties of the selected cableway end feature.

Standard

Cableway

Displays the name of the cableway end feature.

Specification

Displays the specification for the cableway. Specifications are assigned to systems in the Systems and Specifications task.

Part

Displays the part associated with the end, if applicable.

Fill Information

Percent Fill

Displays or defines the percent cable fill in the cableway feature.

See Also

Cableway End Feature Properties Dialog Box (on page 73)

Cableway Properties Dialog Box

Displays cableway run properties for review and editing.

See Also

General Tab (Cableway Properties Dialog Box) (on page 73) Relationship Tab (on page 278) Configuration Tab (on page 275) Notes Tab (on page 277)

General Tab (Cableway Properties Dialog Box)

Displays and defines the general properties of the selected cableway.

NOTE Because cableway run properties are customizable in the reference data, only the properties that are required by the software are documented.

Cableway run properties are divided into several different categories: **Standard**, **Surface Treatment and Coating**, **Cable Fill**, and **Responsibility**. You select which category that you want to define values for by using the **Category** option.

Standard

System

Displays or defines the system for the cableway. The last system that you selected is the default. Select **More** to display all defined systems. You can create a new system in the Systems and Specifications task.

Cableway

Displays or defines the name of the cableway that you are creating. The name is based on the **Name Rule** selection. If you want to type a new name for the run, in the **Name Rule** box, select **User Defined**, and then type a name for the run in the **Name** box.

Name Rule

Specify the naming rule that you want to use to name this run. You can select one of the listed rules or select **User Defined** to specify the run name yourself in the **Name** box.

Specification

Displays or defines the specification for the cableway. Specifications are assigned to systems in the Systems and Specifications task. Only those specifications that are allowed in the system that you selected appear. You define specifications in the reference data.

NOTE If you select the **DBS-0** specification, **Slope** option is displayed. If you select a specification that allows barriers, then the software displays the **Barriers** tab.

For more information on defining specifications, see the *Electrical Reference Data Guide*, available from the **Help > Printable Guides** command in the software.

Number of Barriers

Defines the number of barriers included in the cableway. If you select a specification that allows barriers and you define a number of barriers greater than zero, a **Barriers** tab appears.

Slope

Defines the slope for the duct bank. Enter a value to route a sloped duct bank, or select **Not Sloped** to route a duct bank without slope.

Surface Treatment and Coating

Interior Coating Requirement

Specifies the interior coating requirement for the object. To change the options on the list, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Interior Coating Type

Specifies the type of interior coating for the object. To change the options on the list, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Interior Coating Area

Specifies the area of the interior coating for the object.

Exterior Coating Requirement

Specifies the coating requirement for the object. To change the options on the list, edit the **Coating Type** select list in Catalog.

Exterior Coating Type

Specifies the type of coating for the object. To change the options on the list, edit the **Coating Type** select list in Catalog.

Exterior Coating Area

Specifies the area of the coating for the object.

Coating Color

Specifies the color of the object coating. To change the options on the list, edit the **Coating Color** select list in Catalog. Smart 3D includes this property in the painting area report.

Cable Fill

Fill Efficiency

Specifies the efficiency of the stacking of cables in the cableway. Type a real number, integer, or percent. For example, type 0.9, 90, or 90%.

Signal Type

Specifies the cable usage, which Smart 3D uses in tray fill calculations. To change the options on the list, edit the **Signal Type** select list in Catalog.

Voltage Grade

Specifies the voltage grade, which Smart 3D uses when determining the range of voltage that the cableway can carry. To change the options on the list, edit the **Voltage Grade** select list in Catalog.

Maintenance Volume

A maintenance volume is space reserved for installing and maintaining cables in a cable tray and can be defined at the cableway level and optionally overridden at the feature level. You can also define maintenance volumes for duct banks to reserve space for a mud mat below the duct bank. Use the **Format > View** command to turn on the **Maintenance** aspect so you can see the maintenance volumes in the model.

Maintenance Volume Properties Option

Select **Use Run Properties** to use the maintenance volume properties defined for the parent run. Select **Default Feature Properties** to define maintenance volume settings that are unique for this feature. This option is only available when editing the properties of a feature.

Maintenance Shape

Specifies the maintenance volume shape: Rectangle, Round, or Flat Oval.

Maintenance Diameter

Specifies the diameter of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Round**.

Maintenance Width

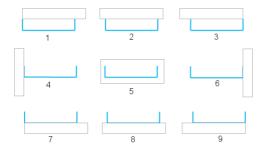
Specifies the width of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Depth

Specifies the depth of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Justification

Specifies how the maintenance volume (gray box below) aligns with the feature (blue cross section below). There are ten options available: (1) **Top Left**, (2) **Top Center**, (3) **Top Right**, (4) **Center Left**, (5) **Center Center**, (6) **Center Right**, (7) **Bottom Left**, (8) **Bottom Center**, (9) **Bottom Right**, and **User Defined**.



Maintenance Width Offset

Specifies the width offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Maintenance Depth Offset

Specifies the depth offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Responsibility

Cleaning Responsibility

Select the party responsible for cleaning the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Cleaning Responsibility** select list in the Catalog task.

Design Responsibility

Select the party responsible for designing the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Design Responsibility** select list in the Catalog task.

Fabrication Responsibility

Select the party responsible for fabricating the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Fabrication Responsibility** select list in the Catalog task.

Installation Responsibility

Select the party responsible for installing the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Installation Responsibility** select list in the

Catalog task.

Painting Responsibility

Select the party responsible for painting the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Painting Responsibility** select list in the Catalog task.

Requisition Responsibility

Select the party responsible for ordering the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Requisition Responsibility** select list in the Catalog task.

Supply Responsibility

Select the party responsible for delivering the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Supply Responsibility** select list in the Catalog task.

Testing Responsibility

Select the party responsible for testing the cableway. If you want to add, edit, or remove values that are available for selection, edit the **Testing Responsibility** select list in the Catalog task.

See Also

Cableway Settings Dialog Box (on page 56)

Cableway Straight Feature Properties Dialog Box

Displays straight feature properties for review and editing.

See Also

Configuration Tab (on page 275)

Cross Section Tab (Cableway Straight Feature Properties Dialog Box) (on page 79)

Edit Cableway Straight Feature Properties (on page 160)

General Tab (Cableway Straight Feature Properties Dialog Box) (on page 77)

General Tab (Conduit Straight Feature Properties Dialog Box) (on page 121)

Relationship Tab (on page 278)

General Tab (Cableway Straight Feature Properties Dialog Box)

Displays and defines the general properties of the selected cableway straight feature.

Standard

Cableway

Identifies the name of the cableway to which the feature is assigned.

Specification

Determines the specification assigned to the cableway.

Length

Specifies the length of the object as routed.

Maintenance Volume

A maintenance volume is space reserved for installing and maintaining cables in a cable tray and can be defined at the cableway level and optionally overridden at the feature level. You can also define maintenance volumes for duct banks to reserve space for a mud mat below the duct bank. Use the **Format > View** command to turn on the **Maintenance** aspect so you can see the maintenance volumes in the model.

Maintenance Volume Properties Option

Select **Use Run Properties** to use the maintenance volume properties defined for the parent run. Select **Default Feature Properties** to define maintenance volume settings that are unique for this feature. This option is only available when editing the properties of a feature.

Maintenance Shape

Specifies the maintenance volume shape: Rectangle, Round, or Flat Oval.

Maintenance Diameter

Specifies the diameter of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Round**.

Maintenance Width

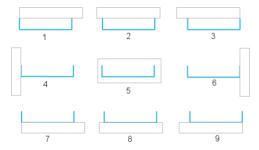
Specifies the width of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Depth

Specifies the depth of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Justification

Specifies how the maintenance volume (gray box below) aligns with the feature (blue cross section below). There are ten options available: (1) **Top Left**, (2) **Top Center**, (3) **Top Right**, (4) **Center Left**, (5) **Center Center**, (6) **Center Right**, (7) **Bottom Left**, (8) **Bottom Center**, (9) **Bottom Right**, and **User Defined**.



Maintenance Width Offset

Specifies the width offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Maintenance Depth Offset

Specifies the depth offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Fill Information

Percent Fill

Displays or defines the percent cable fill in the cableway feature.

See Also

Cableway Straight Feature Properties Dialog Box (on page 77)

Cross Section Tab (Cableway Straight Feature Properties Dialog Box)

Displays and defines the cross section properties of the selected cableway straight feature.

Standard

Cross Section

Defines the shape of the cross section. You can select from rectangular, round, and flat oval. If the cross section is round, only one other property is available: **Diameter**.

Width

Sets the width dimension for rectangular and flat oval cross sections. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current depth. If the **Depth** box is blank, all widths listed in the current specification are shown.

Depth

Sets the depth of the cross section for rectangular and flat oval cross sections. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current width. If the **Width** box is blank, all depths listed in the current specification are shown.

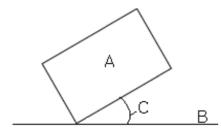
Diameter

Determines the diameter of round cross sections. Values stored in the reference data determine the list of options. You can also enter a value that is not on the list.

Orientation Angle

Sets an angle between the local axis associated with the cross section and the width axis. If the angle value is zero, the width is aligned with the local cross section axis.

The following picture shows the orientation angle (C).



- (A) Cross section
- (B) Width axis
- (C) Orientation angle

Fill Information

Percent Fill

Displays or defines the percent cable fill in the cableway feature.

See Also

Cableway Straight Feature Properties Dialog Box (on page 77)

Cableway Transition Feature Properties Dialog Box

Displays cableway transition properties for review and editing.

See Also

Configuration Tab (on page 275)

Cross Section Tab (Cableway Transition Feature Properties Dialog Box) (on page 81)

Edit Cableway Transition Feature Properties (on page 161)

General Tab (Cableway Transition Feature Properties Dialog Box) (on page 80)

Modify Multiple Cableway Cross Section Sizes (on page 47)

Modify Cableway Feature Cross Section Shape (on page 47)

Relationship Tab (on page 278)

General Tab (Cableway Transition Feature Properties Dialog Box)

Displays and defines the general properties of the selected transition.

Standard

Cableway

Displays or defines the name of the cableway transition feature. You can also let the software use a default name.

Specification

Displays or defines the cableway specification from a list of allowed specifications for the associated system. Specifications are assigned to systems in the Systems and Specifications task.

Transition Type

Displays the type of the transition, such as parallel.

Part

Displays or defines a part associated with the transition, if applicable.

Length

Displays or defines the length of the transition along the cableway. This box appears for straight slanted transitions only.

Fill Information

Percent Fill

Displays or defines the percent cable fill in the cableway feature.

Cross Section Tab (Cableway Transition Feature Properties Dialog Box)

Displays and defines the cross section properties of the selected transition.

Standard

Position

Displays or defines the start or end face of the transition.

Cross Section

Defines the shape of the cross section. You can select from rectangular, round, and flat oval. If the cross section is round, only one other property is available: **Diameter**.

Width

Sets the width dimension for rectangular and flat oval cross sections. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current depth. If the depth is not defined (that is, the **Depth** box is blank), all widths listed in the current specification are shown.

Depth

Sets the depth of the cross section for rectangular and flat oval cross sections. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current width. If the width is not defined (that is, the **Width** box is blank), all depths listed in the current specification are shown.

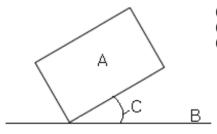
Diameter

Determines the diameter for round cross sections. Values stored in the reference data determine the list of options. You can also enter a value that is not on the list.

Orientation Angle

Sets an angle between the local axis associated with the cross section and the width axis. If the angle value is zero, the width is aligned with the local cross section axis.

The following picture shows the orientation angle (C).



- (A) Cross section
- (B) Width axis
- (C) Orientation angle

Fill Information

Percent Fill

Displays or defines the percent cable fill in the cableway feature.

Cableway Turn Feature Properties Dialog Box

Displays elbows, bends, and other turn properties for review and editing.

See Also

Configuration Tab (on page 275)
Cross Section Tab (Cableway Turn Feature Properties Dialog Box) (on page 84)
Edit Cableway Turn Feature Properties (on page 160)
General Tab (Cableway Turn Feature Properties Dialog Box) (on page 82)
Relationship Tab (on page 278)

General Tab (Cableway Turn Feature Properties Dialog Box)

Displays and defines the general properties of the selected cableway turn feature.

Standard

Cableway

Identifies the name of the cableway to which the feature is assigned.

Specification

Determines the specification assigned to the cableway.

Angle

Displays the measurement of the angle of the turn. You cannot edit the value.

Type

Allows you to select turn types, like **Bend, Miter**, or **Chamfer**, in addition to any other turn types that the run specification allows. If you change specifications to one with parts, the software overrides the type of turn that you have set and replaces it with the default turn type.

Throat Radius

Modifies the throat radius of the turn transition. The list displays the last ten radii that you entered.

Number of Miters

Specifies the number of miters for the turn. If you change the angle of the turn, the software resets the number of miters to the default number defined for the new angle in the reference data.

NOTE The **Number of Miters** box is cleared if the active specification contains parts.

Part

Displays the default part assigned to the turn type. You can override the default part and select a part manually.

Maintenance Volume

A maintenance volume is space reserved for installing and maintaining cables in a cable tray and can be defined at the cableway level and optionally overridden at the feature level. You can also define maintenance volumes for duct banks to reserve space for a mud mat below the duct

bank. Use the **Format > View** command to turn on the **Maintenance** aspect so you can see the maintenance volumes in the model.

Maintenance Volume Properties Option

Select **Use Run Properties** to use the maintenance volume properties defined for the parent run. Select **Default Feature Properties** to define maintenance volume settings that are unique for this feature. This option is only available when editing the properties of a feature.

Maintenance Shape

Specifies the maintenance volume shape: Rectangle, Round, or Flat Oval.

Maintenance Diameter

Specifies the diameter of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Round**.

Maintenance Width

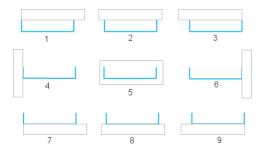
Specifies the width of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Depth

Specifies the depth of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Justification

Specifies how the maintenance volume (gray box below) aligns with the feature (blue cross section below). There are ten options available: (1) **Top Left**, (2) **Top Center**, (3) **Top Right**, (4) **Center Left**, (5) **Center Center**, (6) **Center Right**, (7) **Bottom Left**, (8) **Bottom Center**, (9) **Bottom Right**, and **User Defined**.



Maintenance Width Offset

Specifies the width offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Maintenance Depth Offset

Specifies the depth offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Fill Information

Percent Fill

Displays or defines the percent cable fill in the cableway feature.

Cross Section Tab (Cableway Turn Feature Properties Dialog Box)

Displays and defines the cross section properties of the selected cableway turn feature.

Standard

Cross Section

Defines the shape of the cross section. You can select from rectangular, round, and flat oval. If the cross section is round, only one other property is available: **Diameter**.

Width

Sets the width dimension for rectangular and flat oval cross sections. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current depth. If the **Depth** box is blank, all widths listed in the current specification are shown.

Depth

Sets the depth of the cross section for rectangular and flat oval cross sections. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current width. If the **Width** box is blank, all depths listed in the current specification are shown.

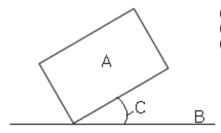
Diameter

Determines the diameter of round cross sections. Values stored in the reference data determine the list of options. You can also enter a value that is not on the list.

Orientation Angle

Sets an angle between the local axis associated with the cross section and the width axis. If the angle value is zero, the width is aligned with the local cross section axis.

The following picture shows the orientation angle (C).



- (A) Cross section
- (B) Width axis
- (C) Orientation angle

Fill Information

Percent Fill

Displays or defines the percent cable fill in the cableway feature.

Cableway Turn Transition Feature Properties Dialog Box

Displays cableway turn transition properties for review and editing.

See Also

Configuration Tab (on page 275)

Cross Section Tab (Cableway Turn Transition Feature Properties Dialog Box) (on page 86) General Tab (Cableway Turn Transition Feature Properties Dialog Box) (on page 85) Relationship Tab (on page 278)

General Tab (Cableway Turn Transition Feature Properties Dialog Box)

Displays and defines the general properties of the selected transition.

Standard

Cableway

Displays or defines the name of the cableway transition feature. You can also let the software use a default name.

Specification

Displays or defines the cableway specification from a list of allowed specifications for the associated system. Specifications are assigned to systems in the Systems and Specifications task.

Transition Type

Displays the type of the transition, such as parallel.

Part

Displays or defines a part associated with the transition, if applicable.

Throat Radius

Displays or defines the throat radius of the transition. The list displays the last ten radii that you entered. This box appears for turn transitions only.

Angle

Displays or defines the angle of the transition. This box appears for turn transitions only.

Fill Information

Percent Fill

Displays or defines the percent cable fill in the cableway feature.

Cross Section Tab (Cableway Turn Transition Feature Properties Dialog Box)

Displays and defines the cross section properties of the selected transition.

Standard

Position

Indicates the position of the cross section.

- Start: The property values that follow define the cross section at the start point of the cableway turn transition feature.
- End: The property values that follow define the cross section at the end point of the cableway turn transition feature.

Cross Section

Defines the shape of the cross section. You can select from rectangular, round, and flat oval. If the cross section is round, only one other property is available: **Diameter**.

Width

Sets the width dimension for rectangular and flat oval cross sections. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current depth. If the **Depth** box is blank, all widths listed in the current specification are shown.

Depth

Sets the depth of the cross section for rectangular and flat oval cross sections. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current width. If the **Width** box is blank, all depths listed in the current specification are shown.

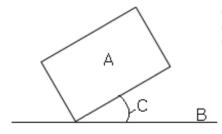
Diameter

Determines the diameter of round cross sections. Values stored in the reference data determine the list of options. You can also enter a value that is not on the list.

Orientation Angle

Sets an angle between the local axis associated with the cross section and the width axis. If the angle value is zero, the width is aligned with the local cross section axis.

The following picture shows the orientation angle (C).



- (A) Cross section
- (B) Width axis
- (C) Orientation angle

Fill Information

Percent Fill

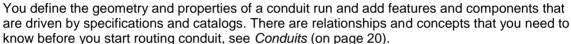
Displays or defines the percent cable fill in the cableway feature.

SECTION 4

Route Conduit

Creates, models, and extends conduit runs quickly and precisely. Conduit houses and protects cable in the model. Conduit run features and components are driven by constraints, specifications, and catalog data. With this command, you can:

- Route new conduit in free space
- Route conduit in a duct bank
- Route conduit to or from a feature
- Insert components on a conduit run



By default, the software uses fast mode routing, which means that you do not see elbow or turn graphics while in dynamic display. Press SHIFT+F to toggle fast mode on and off. After you define the conduit run location, the software displays the elbows.

Route Conduit Ribbon

Provides commands for placing conduit.

Properties

Displays the **Conduit Settings** dialog box. For more information, see *Conduit Settings Dialog Box* (on page 106).

T Start Route

Click to specify the starting location for the conduit.

End Route

Click to specify the terminating location for the conduit.

ℋ Plane

Activates options for selecting a working plane for the route path. Six options are available:

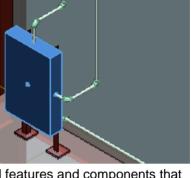
Plan Plane

Defines the work surface as the XY plane at the depth of the active end. You also can press CTRL+1 to select this option.

Elevation Plane: East-West (Z Plane: X-Axis)

Defines the work surface as the XZ plane. You also can press CTRL+2 to select this option.

Elevation Plane: North-South (Z Plane: Y-Axis)



Defines the work surface as the YZ plane. You also can press CTRL+3 to select this option.

Plane by Turn/Branch

Defines the work surface as the plane defined by an existing turn or branch. You select the turn or branch to set the plane. You also can press CTRL+4 to select this option.

Plane by Three Points

Defines the work surface using three points that you define. You also can press CTRL+5 to select this option.

X No Plane

Clears any work surfaces. The software does not project points that you place to any plane. You also can press CTRL+6 to select this option.

Run

Displays existing conduit runs along with the <New Conduit Run>, <New/Continue Run>, <Select Graphically> and More options.

- New Conduit Run> Displays the New Conduit Run dialog box. Use this option to create a new conduit run to route. If a new conduit run is created, all runs associated with the system parent selected on the New Conduit Run dialog box display in the list.
- New/Continue Run> Extends an existing conduit run if you select the end feature of that conduit run. If a run is continued, all runs associated with the system parent of the continued run display in the list. If you do not select an end feature, the New Conduit Run dialog box is displayed to create a conduit run. For more information, see New Conduit Run Dialog Box (on page 109).
- <Select Graphically> Selects an existing conduit run in a graphic view, or the Workspace Explorer.
- More Displays the Select Conduit dialog box. Use this option to select a conduit run
 that is associated with a different system parent. For more information, see Select
 Conduit Dialog Box (on page 112).

Angle Lock

Locks or unlocks the Angle box.

Angle

Enter or select an angle for the current route segment. You can enter any value needed, provided it does not conflict with the defined specifications. If the **Angle Lock** is unlocked, this box displays a dynamic readout of the current bend angle.

😘 Length Lock

Locks or unlocks the **Length** box.

Length

Enter or select a length for the current route segment.

Offset

Controls the SmartSketch offset constraint. Type the distance that you want to offset the conduit that you are routing. Select **<Disabled>** if you do not want to use the offset

constraint to help route the conduit. Select **Set Offset Reference** to define the reference point. For more information on setting the reference point, see *Set Offset Reference Dialog Box (Conduit)* (on page 113).

Edit Conduit Along-leg Feature Ribbon

Displays options for conduit along-leg features placed in the model.

Properties

Displays the **Conduit Branch Feature Properties** dialog box. For more information, see *Conduit Branch Feature Properties Dialog Box* (on page 114).

Move From

Click to specify the starting location of the move vector. If you do not define a starting point, the software assumes that the current location of the object is the starting point.

Move To

Click to specify the ending location of the move vector.

Run

Displays the name of the conduit run to which the along-leg feature is associated. All other conduit runs associated with the same parent also appear in the list. Another conduit run can be selected if needed. Select **More** to select a conduit run associated with a different system parent.

Type

Displays the short code associated with the selected along-leg feature. The **Type** list also contains the short codes associated with any other end components defined in the specification for the current nominal diameter. Selecting an entry from the **Type** list replaces the selected component with one of a different type.

Option

Displays the option of the selected along-leg feature. The **Option** list also contains any options defined in the specification for the short code selected in the **Type** box. Selecting another entry from the **Option** list updates the object accordingly.

₩ Flip

Orients the branch so that the selected port is located at the insertion point. If a tee or other tee-tee branch is located along the length of a conduit or between two components, only the in-line ports of the component are available when flipping. However, if the same component is located at the end of a run, all component ports are available.

Angle 1

Specifies the angle of the branch.

Angle 2

Specifies the angle of the turn or branch feature located at the other end of the branch leg. If this box is blank, there is no turn or branch feature located at the end of the branch leg.

Edit Conduit Branch Feature Ribbon

Displays options for conduit branches placed in the model.

Properties

Displays the **Conduit Branch Feature Properties** dialog box. For more information, see *Conduit Branch Feature Properties Dialog Box* (on page 114).

Move From

Click to specify the starting location of the move vector. If you do not define a starting point, the software assumes that the current location of the object is the starting point.

Move To

Click to specify the ending location of the move vector.

Run

Displays the name of the conduit run to which the branch is associated. All other conduit runs associated with the same parent also appear in the list. Another conduit run can be selected if needed. Select **More** to select a conduit run associated with a different system parent.

Type

Displays the type of the selected branch feature. The **Type** list also contains the short codes associated with any other end components defined in the specification for the current nominal diameter. Selecting an entry from the **Type** list replaces the selected component with one of a different type.

Option

Displays the option of the selected branch feature. The **Option** list also contains any options defined in the specification for the short code selected in the **Type** box. Selecting another entry from the **Option** list updates the object accordingly.

₩ Flip

Orients the branch so that the selected port is located at the insertion point. If a tee or other tee-tee branch is located along the length of a conduit or between two components, only the in-line ports of the component are available when flipping. However, if the same component is located at the end of a run, all component ports are available.

Angle 1

Specifies the angle of the branch.

Angle 2

Specifies the angle of the turn or branch feature located at the other end of the branch leg. If this box is blank, there is no turn or branch feature located at the end of the branch leg.

Edit Conduit End Feature Ribbon

Displays options for editing an end component, such as a plug.

Properties

Displays the **Conduit End Feature Properties** dialog box. For more information, see *Conduit End Feature Properties Dialog Box* (on page 117).

Move From

Click to specify the starting location of the move vector. If you do not define a starting point, the software assumes that the current location of the object is the starting point.

Move To

Click to specify the ending location of the move vector.

NOTE When you move or modify a route object in HVAC, Electrical, or Piping, Smart 3D treats any unfinished ends as free end features. An unfinished end is an end with mating parts or a logical data connection with one logical port. You can reconnect using these free end features. This behavior allows you to reuse existing mating parts and connections and reduces wait times.

Plane

Activates options for selecting a working plane for the route path. Six options are available:

Plan Plane

Defines the work surface as the XY plane at the depth of the active end. You also can press CTRL+1 to select this option.

Llevation Plane: East-West (Z Plane: X-Axis)

Defines the work surface as the XZ plane. You also can press CTRL+2 to select this option.

Elevation Plane: North-South (Z Plane: Y-Axis)

Defines the work surface as the YZ plane. You also can press CTRL+3 to select this option.

Ø Plane by Turn/Branch

Defines the work surface as the plane defined by an existing turn or branch. You select the turn or branch to set the plane. You also can press CTRL+4 to select this option.

Plane by Three Points

Defines the work surface using three points that you define. You also can press CTRL+5 to select this option.

X No Plane

Clears any work surfaces. The software does not project points that you place to any plane. You also can press CTRL+6 to select this option.

Run

Displays the name of the conduit run with which the selected end feature is associated.

Type

Displays the short code associated with the selected end. The **Type** list also contains the short codes associated with any other end components defined in the specification for the current nominal diameter. Selecting an entry from the **Type** list replaces the selected end component with one of a different type.

Option

Displays the option of the selected end. The Option list also contains any options defined in

the specification for the short code selected in the **Type** box. Selecting another entry from the **Option** list updates the object accordingly.

3 Angle Lock

Locks or unlocks the Angle box.

Angle

Displays the angle of any turn or branch component that is located at the other end of the leg with which the selected end feature is associated. If no turn or branch exists at the other end of the leg, then this box is disabled. Changing the angle value adjusts the position of the selected end feature to achieve the specified angle and then locks that angle value. When this box is unlocked, the value updates dynamically as the selected end component is moved.

1 Length Lock

Locks or unlocks the Length box.

Length

Displays the length of the conduit connected to the end being edited. Entering a value in this box adjusts the position of the selected end feature to achieve the specified length and then locks that length value. When this box is unlocked, the value updates dynamically as the selected end component is moved.

Offset

Controls the SmartSketch® offset constraint. Type the distance that you want to offset the conduit that you are routing. Select **<Disabled>** if you do not want to use the offset constraint to help route the conduit. Select **Set Offset Reference** to define the reference point. For more information on setting the reference point, see *Set Offset Reference Dialog Box (Conduit)* (on page 113).

Edit Conduit Straight Feature Ribbon

Displays options for editing a conduit straight feature.

Properties

Displays the **Conduit Straight Feature Properties** dialog box. For more information, see *Conduit Straight Feature Properties Dialog Box* (on page 121).

Move From

Click to specify the starting location of the move vector. If you do not define a starting point, the software assumes that the current location of the object is the starting point.

Move To

Click to specify the ending location of the move vector.

Plane

Activates options for selecting a working plane for the route path. Six options are available:

Plan Plane

Defines the work surface as the XY plane at the depth of the active end. You also can press CTRL+1 to select this option.

Elevation Plane: East-West (Z Plane: X-Axis)

Defines the work surface as the XZ plane. You also can press CTRL+2 to select this option.

Elevation Plane: North-South (*\tilde Z Plane: Y-Axis)

Defines the work surface as the YZ plane. You also can press CTRL+3 to select this option.

Plane by Turn/Branch

Defines the work surface as the plane defined by an existing turn or branch. You select the turn or branch to set the plane. You also can press CTRL+4 to select this option.

Plane by Three Points

Defines the work surface using three points that you define. You also can press CTRL+5 to select this option.

X No Plane

Clears any work surfaces. The software does not project points that you place to any plane. You also can press CTRL+6 to select this option.

Run

Displays the name of the conduit run with which the selected conduit is associated. All other conduit runs associated with the same parent also appear in the list. Another conduit run can be selected if needed. Select **More** to select a conduit run associated with a different system parent.

Type

Displays the short code associated with the selected conduit. The **Type** list also contains the short codes associated with any other conduit defined in the specification for the current nominal diameter. Selecting an entry from the **Type** list replaces the selected conduit with one of a different type.

Option

Displays the option of the selected conduit. The **Option** list also contains any options defined in the specification for the short code selected in the **Type** box. Selecting another entry from the **Option** list updates the object accordingly.

A Lock Length

Defines whether or not the length of the selected conduit should remain constant while moving.

When locked (4), the software automatically modifies the turn points, along with the length and angle of adjacent straight features, to remain connected to the moved leg. The length of the moved leg does not change.

When not locked A, the software extends or shortens the associated legs to connect with the new position of the moved conduit. The length of the moved leg can change. Any component on the moved conduit maintains its relative position from the conduit ends.

Offset

Controls the SmartSketch offset constraint. Type the distance that you want to offset the conduit that you are editing. Select **<Disabled>** if you do not want to use the offset

constraint. Select **Set Offset Reference** to define the reference point. For more information on setting the reference point, see *Set Offset Reference Dialog Box (Conduit)* (on page 113).

Max Fill

Displays the percent maximum fill of the conduit straight feature. This button is enabled if the conduit contains cable. You can click this button to depress it, and the software will highlight the area with the maximum fill on the conduit in the model.

Edit Conduit Turn Feature Ribbon

Displays options for turns or bends placed in the model.

Properties

Displays the **Conduit Turn Feature Properties** dialog box. For more information, see *Conduit Turn Feature Properties Dialog Box* (on page 123).

Move From

Click to specify the starting location of the move vector. If you do not define a starting point, the software assumes that the current location of the object is the starting point.

Move To

Click to specify the ending location of the move vector.

Plane

Activates options for selecting a working plane for the route path. Six options are available:

Plan Plane

Defines the work surface as the XY plane at the depth of the active end. You also can press CTRL+1 to select this option.

Defines the work surface as the XZ plane. You also can press CTRL+2 to select this option.

Elevation Plane: North-South (*\forall Z Plane: Y-Axis)

Defines the work surface as the YZ plane. You also can press CTRL+3 to select this option.

Ø Plane by Turn/Branch

Defines the work surface as the plane defined by an existing turn or branch. You select the turn or branch to set the plane. You also can press CTRL+4 to select this option.

Plane by Three Points

Defines the work surface using three points that you define. You also can press CTRL+5 to select this option.

X No Plane

Clears any work surfaces. The software does not project points that you place to any plane. You also can press CTRL+6 to select this option.

Run

Displays the name of the conduit run with which the selected turn is associated. All other conduit runs associated with the same parent also appear in the list. Another conduit run can be selected if needed. Select **More** to select a conduit run associated with a different system parent.

Type

Displays the short code associated with the selected turn. The **Type** list also contains the short codes associated with any other turns defined in the specification for the current nominal diameter. Selecting an entry from the **Type** list replaces the selected turn with one of a different type.

Option

Displays the option of the selected turn. The **Option** list also contains any options defined in the piping specification for the short code selected in the **Type** box. Selecting another entry from the **Option** list updates the object accordingly.

3 Angle Lock

Locks or unlocks the **Angle** box. Locking the corresponding angle value creates a constraint along which the selected turn angle can be moved.

Angle 2

Specifies the angle of the turn feature located at the end of one associated leg. If this box is blank, there is no turn feature located at the end of the leg. Although this value can be changed, the location of the corresponding turn cannot. Modification of this value repositions the selected turn until the specified angle is achieved.

Angle 1

Specifies the angle of the turn that you are editing. Modification of this value repositions the selected turn until the specified angle is achieved.

Angle 3

Specifies the angle of the turn feature located at the end of one associated leg. If this box is blank, there is no turn feature located at the end of the leg. Although this value can be changed, the location of the corresponding turn cannot. Modification of this value repositions the selected turn until the specified angle is achieved.

Offset

Controls the SmartSketch offset constraint. Type the distance that you want to offset the conduit that you are routing. Select **<Disabled>** if you do not want to use the offset constraint. Select **Set Offset Reference** to define the reference point. For more information on setting the reference point, see *Set Offset Reference Dialog Box (Conduit)* (on page 113).

What do you want to do?

- Create new conduit (on page 97)
- Add conduits to a duct bank (on page 99)
- Delete conduit from duct bank (on page 155)
- Connect conduit end features (on page 99)

- Place components while routing conduit (on page 100)
- Route conduit with an external offset (on page 102)
- Copy a conduit run (on page 105)
- Extend an existing conduit run (on page 105)
- Move a conduit run (on page 143)
- Move a conduit branch (on page 148)

Create new conduit

- 1. Click Route Conduit .
- 2. Select a starting point in the graphic view for the new conduit.



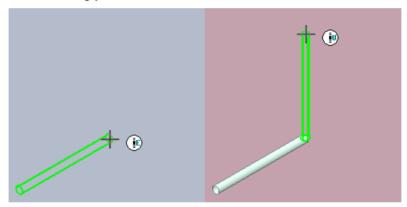
TIP If you select a feature located at the end of an existing run, the software continues the run of the selected feature. Skip to step 5.

The **New Conduit Run** dialog box displays. For more information, see New Conduit Run Dialog Box (on page 109).

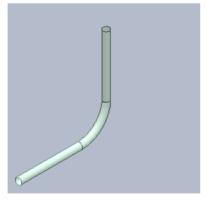
- 3. Select the system for the conduit in the **System** box.
 - TIP The **System** box lists up to the last ten selected systems. Choose **More...** to browse all applicable systems in the workspace and model database.
- 4. In the **Name** box, type the name of the conduit that you are creating. If you do not enter a name, the software automatically generates a name.
 - TIP You can choose a naming rule in the Name Rule box, if necessary.
- 5. If necessary, change the specification of the new conduit in the **Specification** box.
- 6. If necessary, select a diameter in the **Nominal Conduit Diameter** box.
 - NOTE Use the Category option to view more properties that you can set for the conduit.
- 7. Click **OK** to return to the **Route Conduit** command.
- 8. On the ribbon, click **Plane** \mathbb{X} and select your working surface.

Plane Ribbon Options

- Plan Plane Defines the work surface as the XY plane at the depth of the active end. You also can press CTRL+1 to select this option.
- Elevation Plane: East-West Defines the work surface as the XZ plane. You also can press CTRL+2 to select this option.
- **Elevation Plane: North-South** Defines the work surface as the YZ plane. You also can press CTRL+3 to select this option.
- Plane by Turn/Branch Defines the work surface as the plane defined by an existing turn or branch. You select the turn or branch to set the plane. You also can press CTRL+4 to select this option.
- Plane by Three Points Defines the work surface using three points that you define. You also can press CTRL+5 to select this option.
- No Plane Clears any work surfaces. The software does not project points that you place to any plane. You also can press CTRL+6 to select this option.
- 1. Click in the graphic view to route the conduit.
 - TIP You can use PinPoint, Point Along, and the SmartSketch3D relationship indicators when defining your conduit.



2. Right-click to end the routing of conduit.



NOTE Using the **Angle** and **Length** constraints, you can lock these parameters while routing a conduit.

Add conduits to a duct bank

To add conduits to a duct bank, you need to manually route the conduits using tools such as the offset command assistant to position a conduit into the duct bank's encasement. For more information, see *Route conduit with an external offset* (on page 102).

If there is not sufficient space, the cross section of the duct bank will have to be increased as needed and the encasement and other conduits might have to be manually jogged to maintain the relative positioning. Change the size of the duct bank by selecting all the features of the entire duct bank and then changing their values on the ribbon.

The relation between the conduit run and the duct bank will have to be manually established or removed.

Connect conduit end features

Smart 3D enables you to connect end features of existing conduits using the zero-spec cableway. You can then route cables to pass through the resulting cableway. You can manually connect conduit end features, or you can use the **Auto Connect Cableway** command on the drawing toolbar.

Using Auto Connect

- 1. Locate the conduits you want to connect in creating your route.
- 2. Click Auto Connect 3.
- From the Auto Connect Cableway ribbon, select Conduit End Features from the filter pull-down menu.
- 4. Select the conduit end feature in the graphic view to begin the connection.
- 5. Click **Select to Runs** on the **Auto Connect Cableway** ribbon, and then select the end feature of the conduit to which you want to connect.
- 6. Click Finish.

The new Cws-0 cableway is automatically calculated and placed.

Connecting Manually

- 1. Locate the conduits you want to connect in creating your route.
- 2. Click Route Cableway 7.
- 3. In the graphic view, select the conduit end feature you want as the starting point.
 - **NOTE** If you selected an end feature before selecting the **Route Cableway** command, that feature is the default starting point for the new cableway.
- 4. On the New Cableway Dialog Box (on page 61), set Specifications to Cws-0.
- 5. Set other required cableway properties, and then click **OK**.
- 6. Select conduit end feature in the graphic view to define the endpoint of the connecting cableway.

Place components while routing conduit

- 1. Click Route Conduit 2.
- 2. Select the run starting point.
 - TIP If you selected an end feature of an existing run, the software continues that run. Skip to step 5.

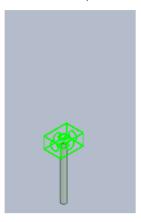
The **New Conduit Run** dialog box displays. For more information, see New Conduit Run Dialog Box (on page 109).

- 3. Select the system for the conduit in the **System** box.
 - TIP The **System** box lists up to the last ten selected systems. Choose **More...** to browse all applicable systems in the workspace and model database.
- 4. In the **Name** box, type the name of the conduit that you are creating. If you do not enter a name, the software automatically generates a name.
 - TIP You can choose a naming rule in the Name Rule box, if necessary.
- 5. If necessary, change the specification of the new conduit in the **Specification** box.
- 6. If necessary, select a diameter in the **Nominal Conduit Diameter** box.
 - NOTE Use the Category option to view more properties that you can set for the conduit.
 - Click **OK** to return to the **Route Conduit** command.
- 7. Click in the graphic view to begin routing the conduit.

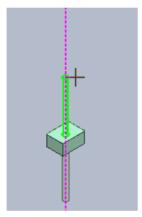


8. Click Insert Component ಶ when you want to insert a component.

9. On the ribbon, select the component type.



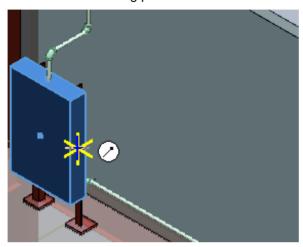
- 10. Click Finish.
- 11. Continue routing the conduit.



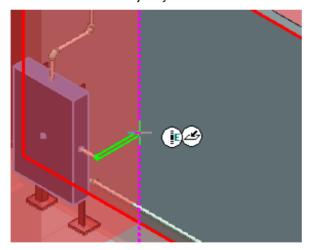
NOTE You can continue routing an existing run by selecting a run end feature or by selecting the run name from the list of available runs.

Route conduit with an external offset

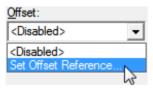
- 1. Click Route Conduit 7.
- 2. Select the run starting point.



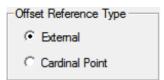
- 3. Define the conduit properties on the *New Conduit Run dialog box* (on page 109), and then click **OK**.
- 4. Route towards the object you want to offset from.



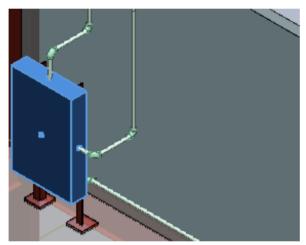
5. From the Offset option, select Set Offset Reference.



6. Select External from the Offset Reference Type grouping.

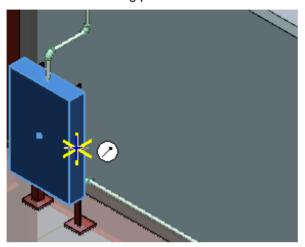


- 7. On the **Set Offset Reference** dialog box, select the option to use from the **Measured from** field.
- 8. Type the offset distance to use in the **Offset** box.
- 9. Click **OK** on the **Set Offset Reference** dialog box.
- 10. Move the pointer over the object in the model from which you want to measure the offset until the object is added to the SmartSketch3D locate list.
- 11. Move the pointer until the offset glyph @ appears, and then click to route the run.
- 12. Select the ending point of the run. Right-click to end a run that does not terminate in a nozzle or branch.

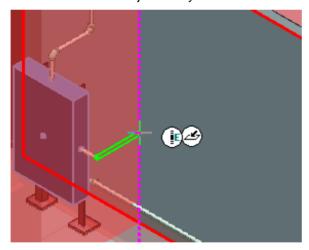


Route conduit with a cardinal point offset

- 1. Click Route Conduit .
- 2. Select the run starting point.



- 3. Define the conduit properties on the *New Conduit Run dialog box* (on page 109), and then click **OK**.
- 4. Route towards the object that you want to offset from.



5. From the Offset option, select Set Offset Reference.



- 6. Select Cardinal Point from the Offset Reference Type grouping.
- 7. Select a cardinal point on the illustration.
- 8. Click **OK** on the **Set Offset Reference** dialog box.

- 9. Select the appropriate route plane.
- 10. Click in the model to route the run.
- 11. Select the ending point of the run. Right-click to end a run that does not terminate in a nozzle or branch.

Copy a conduit run

- 1. Click Select &.
- 2. Select Conduit Runs in the Locate Filter box.
- 3. Select the conduit run to copy.
- 4. Click Edit > Copy.
- 5. Select a reference point in the model.
- 6. Click Edit > Paste.
 - TIP If you selected Paste in Place, then select Move 🏶 from the main ribbon, and identify a location in the model for the conduit run.

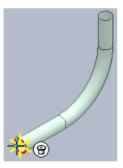
NOTE If you position an end of the copied conduit run so that it touches a conduit run end or nozzle, the software automatically connects the two.

Extend an existing conduit run

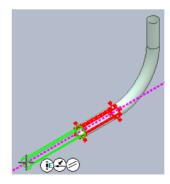
1. Click Route Conduit .



2. Select the end feature from which to extend the conduit run.



3. Route the conduit run as needed.



Conduit Settings Dialog Box

Sets options for a conduit run while you are routing.

See Also

General Tab (Conduit Settings Dialog Box) (on page 106) Defaults Tab (Conduit Settings Dialog Box) (on page 109)

General Tab (Conduit Settings Dialog Box)

Displays the general properties of the conduit that you are routing.

NOTE Because conduit run properties are customizable in the reference data, only the properties that are required by the software are documented.

Conduit properties are divided into several different categories: **Standard**, **Surface Treatment and Coating**, **Cable Fill**, and **Responsibility**. You select which category that you want to define values for by using the **Category** option.

Standard

System

Displays or defines the system for the conduit. The last system that you selected is the default. Select **More** to display all defined systems. You can create a new system in the Systems and Specifications task.

Conduit Run

Displays or defines the name of the conduit that you are creating.

Specification

Displays or defines the specification for the conduit. Specifications are assigned to systems in the Systems and Specifications task. Only those specifications that are allowed in the system that you selected appear. You define specifications in the reference data. See the *Electrical Reference Data Guide* for more information on defining specifications.

Nominal Conduit Diameter

Displays or defines the conduit diameter. The specification controls the available NPDs in this list. Select the nominal pipe diameter (NPD) that you want to use for this run. If you select a nozzle as the starting point of your conduit run, the software automatically uses the NPD of the nozzle as the NPD of the conduit run.

Surface Treatment and Coating

Interior Surface Treatment

Select the interior surface treatment for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Interior Surface Treatment** sheet in the **AllCodeLists.xls** workbook in the reference data.

Exterior Surface Treatment

Select the exterior surface treatment for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Exterior Surface Treatment** sheet in the

AllCodeLists.xls workbook in the reference data.

Cleaning Requirement

Select the cleaning requirement for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Cleaning Requirement** sheet in the **AllCodeLists.xls** workbook in the reference data.

Steamout Requirement

Select the steamout requirement for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Steamout Requirement** sheet in the **AllCodeLists.xls** workbook in the reference data.

Steamout Pressure

Specify the steamout pressure for the conduit. Include the pressure unit of measure, psi for pounds per square inch for example, when specifying this value.

Steamout Temperature

Specify the steamout temperature for the conduit. Include the temperature unit of measure, K for Kelvin, F for Fahrenheit, or C for Celsius for example, when specifying this value.

Interior Coating Requirement

Select the coating requirement of the interior coating for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Interior Coating Type

Select the type of interior coating for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Interior Coating Area

Enter the total area that the interior coating covers.

Exterior Coating Requirement

Select the coating requirement of the exterior coating for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Exterior Coating Type

Select the type of exterior coating for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Exterior Coating Area

Enter the total area that the exterior coating covers.

Coating Color

Select the color of the conduit coating. If you want to add, edit, or remove values that are available for selection, edit the **Coating Color** sheet in the **AllCodeLists.xls** workbook in the reference data.

Cable Fill

Fill Efficiency

Displays or defines the efficiency of the stacking of cables in the conduit. You can enter a real number, integer, or percent; for example, type 0.9, 90, or 90%.

Signal Type

Displays or defines the cable usage, which is used in tray fill calculations. If you want to add, edit, or remove values that are available for selection, edit the **Signal Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Voltage Grade

Displays or defines the voltage grade, which is used in determining the range of voltage that the conduit can carry. If you want to add, edit, or remove values that are available for selection, edit the **Voltage Grade** sheet in the **AllCodeLists.xls** workbook in the reference data

Responsibility

Cleaning Responsibility

Select the party responsible for cleaning the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Cleaning Responsibility** select list in the Catalog task.

Design Responsibility

Select the party responsible for designing the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Design Responsibility** select list in the Catalog task.

Fabrication Responsibility

Select the party responsible for fabricating the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Fabrication Responsibility** select list in the Catalog task.

Installation Responsibility

Select the party responsible for installing the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Installation Responsibility** select list in the Catalog task.

Painting Responsibility

Select the party responsible for painting the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Painting Responsibility** select list in the Catalog task.

Requisition Responsibility

Select the party responsible for ordering the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Requisition Responsibility** select list in the Catalog task.

Supply Responsibility

Select the party responsible for delivering the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Supply Responsibility** select list in the

Catalog task.

Testing Responsibility

Select the party responsible for testing the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Testing Responsibility** select list in the Catalog task.

Defaults Tab (Conduit Settings Dialog Box)

Displays the default properties of the conduit that you are routing.

Automatic Angle Lock On

Specifies if the Angle lock should automatically lock when you type a new angle value into the **Angle** box.

Remember Working Plane

Allows you to choose whether the software remembers the last used working plane. **False** clears the last selected plane so that you must reset the plane each time that you begin routing. **True** remembers the last used working plane. The software then remembers your selection and locks each route onto the plane. The default option is **False.**

When Remember Working Plane is set to False, the default plane option for Route Conduit is No Plane. Each time that you click a routing command, the system clears the last selected Plane option. You must reset the plane option each time that you begin a route.

However, you can set the default behavior to remember the last used working plane by setting **Remember Working Plane** to **True**. The software then locks the route onto the plane that you are using and remembers your selection within that session only.

NOTE This option is available when you are routing duct, piping, cableways, and conduits. Setting this option to **True** when you are in any of these tasks results in an automatic **True** setting for all tasks. Likewise, setting this option to **False** when you are in any of these tasks results in an automatic **False** setting for all tasks.

New Conduit Run Dialog Box

Creates a new conduit run in your model using properties that you specify. You can access the **New Conduit Run** dialog box by going to the Electrical task, selecting the **Route Conduit** command, and then selecting **<New Conduit Run>** from the **Run** option on the ribbon.

Standard

System

Displays or defines the system for the conduit. The last system that you selected is the default. Select More to display all defined systems. You can create a new system in the Systems and Specifications task.

Name

Displays or defines the name of the conduit that you are creating. The name is based on the **Name Rule** selection. If you want to type a new name for the run, in the **Name Rule** box, select **User Defined**, and then type a name for the run in the **Name** box.

Name Rule

Specify the naming rule that you want to use to name this run. You can select one of the listed rules or select **User Defined** to specify the run name yourself in the Name box.

Specification

Displays or defines the specification for the conduit. Specifications are assigned to systems in the Systems and Specifications task. Only those specifications that are allowed in the system that you selected appear. You define specifications in the reference data.

For more information on defining specifications, see the Electrical Reference Data Guide, available from the Help > Printable Guides command in the software.

Nominal Conduit Diameter

Defines the nominal diameter of a conduit.

Surface Treatment and Coating

Interior Surface Treatment Requirement

Select the interior treatment requirement for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Interior Surface Treatment** select list in the Catalog task.

Interior Surface Treatment Type

Select the interior treatment type for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Interior Surface Treatment** select list in the Catalog task.

Exterior Surface Treatment Requirement

Select the exterior treatment requirement for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Exterior Surface Treatment** select list in the Catalog task.

Exterior Surface Treatment Type

Select the exterior treatment type for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Exterior Surface Treatment** select list in the Catalog task.

Cleaning Requirement

Select the cleaning requirement for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Cleaning Requirement** select list in the Catalog task.

Steamout Requirement

Select the steam out requirement for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Steamout Requirement** select list in the Catalog task.

Steamout Pressure

Specify the steamout pressure for the conduit. Include the pressure unit of measure, psi for pounds per square inch for example, when specifying this value.

Steamout Temperature

Specify the steamout temperature for the conduit. Include the temperature unit of measure, K for Kelvin, F for Fahrenheit, or C for Celsius for example, when specifying this value.

Auxiliary Treatment Requirement

Specify any auxiliary treatment requirement.

Auxiliary Treatment Type

Specify any auxiliary treatment type.

Interior Coating Requirement

Select the interior coating requirement for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Coating Type** select list in the Catalog task.

Interior Coating Type

Select the interior coating type for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Coating Type** select list in the Catalog task.

Interior Coating Area

Enter the total area that the coating covers.

Exterior Coating Requirement

Select the exterior coating requirement for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Coating Type** select list in the Catalog task.

Exterior Coating Type

Select the exterior coating type for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Coating Type** select list in the Catalog task.

Coating Color

Select the color of the conduit coating. If you want to add, edit, or remove values that are available for selection, edit the **Coating Color** select list in the Catalog task.

Exterior Coating Area

Enter the total area that the coating covers.

Cable Fill

Fill Efficiency

Displays or defines the efficiency of the stacking of cables in the conduit. You can enter a real number, integer, or percent; for example, type 0.9, 90, or 90%.

Signal Type

Displays or defines the cable usage, which is used in tray fill calculations. If you want to add, edit, or remove values that are available for selection, edit the Signal Type sheet in the AllCodeLists.xls workbook in the reference data.

Voltage Grade

Displays or defines the voltage grade, which is used in determining the range of voltage that the conduit can carry. If you want to add, edit, or remove values that are available for selection, edit the Voltage Grade sheet in the AllCodeLists.xls workbook in the reference

data.

Responsibility

Cleaning Responsibility

Select the party responsible for cleaning the conduit. If you want to add, edit, or remove values that are available for selection, edit the Cleaning Responsibility select list in the Catalog task.

Design Responsibility

Select the party responsible for designing the conduit. If you want to add, edit, or remove values that are available for selection, edit the Design Responsibility select list in the Catalog task.

Fabrication Responsibility

Select the party responsible for fabricating the conduit. If you want to add, edit, or remove values that are available for selection, edit the Fabrication Responsibility select list in the Catalog task.

Installation Responsibility

Select the party responsible for installing the conduit. If you want to add, edit, or remove values that are available for selection, edit the Installation Responsibility select list in the Catalog task.

Painting Responsibility

Select the party responsible for painting the conduit. If you want to add, edit, or remove values that are available for selection, edit the Painting Responsibility select list in the Catalog task.

Requisition Responsibility

Select the party responsible for ordering the conduit. If you want to add, edit, or remove values that are available for selection, edit the Requisition Responsibility select list in the Catalog task.

Supply Responsibility

Select the party responsible for delivering the conduit. If you want to add, edit, or remove values that are available for selection, edit the Supply Responsibility select list in the Catalog task.

Testing Responsibility

Select the party responsible for testing the conduit. If you want to add, edit, or remove values that are available for selection, edit the Testing Responsibility select list in the Catalog task.

Select Conduit Dialog Box

Displays all the conduits so that you can select the conduit that you want. Select a conduit from the hierarchy, and then click **OK**.

NOTE Look In options are currently only available for Quick Route ➡.

Look In

Specifies the location in which you want to look for the conduit.

- Workspace Displays all conduits placed in the defined workspace only.
- Database Displays all of the conduits available in the entire model database.

Set Offset Reference Dialog Box (Conduit)

Sets options for reference offsets while routing conduit. For more information, see *Route conduit* with an external offset (on page 102).

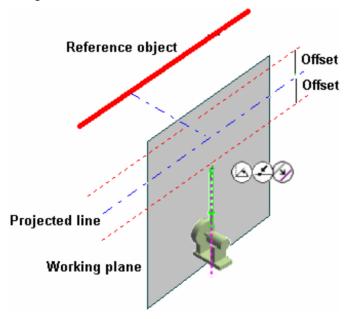
Offset Reference Type

Select the offset type you want to use.

- External Routes a conduit a specified distance from another object, such as another conduit running parallel to the one you are placing.
- Cardinal Point Routes a conduit by the top, sides, bottom, or invert elevation of the
 conduit instead of the conduit centerline. You must use Tools > PinPoint and lock the
 plane when using this reference type. For example, if you are routing the conduit by the
 invert elevation cardinal point, you must lock the elevation plane at the invert elevation
 you want to use.

If the referenced object is a planar surface (such as a slab or deck), then the offset distance is measured from the surface to the selected reference plane (for example, the Elevation Plane: East-West (Z Plane: X-axis) on which the conduit is being routed.

If the referenced object is a linear element (such as a structural beam), then the offset distance is measured from the line to the selected reference plane on which the conduit is being routed.



Offset

Specifies the offset distance. Type the distance that you want to offset. You can turn off the

offset option by selecting <Disabled>.

Measured From

Select the object from which you want to measure the offset. You can select from:

- Centerline Select this option if you want to measure the offset from the centerline of a conduit run.
- Conduit surface Select this option if you want to measure the offset from the outside surface of a conduit run.
- Largest surface (flange) Select this option if you want to measure from the object that
 has the greatest diameter on the conduit run. The object could be the conduit surface or
 a conduit part.
- Staggered Select this option to measure from the largest object on the conduit that
 you are routing to the largest surface on the conduit that you are referencing. Use this
 option when you want to get conduit centerlines as close as possible.

Conduit Branch Feature Properties Dialog Box

Displays branch properties for review and editing.

See Also

Configuration Tab (on page 275)
Relationship Tab (on page 278)
Edit Conduit Branch Feature Properties (on page 162)
General Tab (Conduit Branch Feature Properties Dialog Box) (on page 114)

General Tab (Conduit Branch Feature Properties Dialog Box)

Displays and defines the general properties of the selected conduit branch feature.

Standard

System

Displays the system to which the branch feature belongs. You cannot change the system of the branch feature.

Conduit Run

Specifies the conduit run to which the branch feature belongs. Other runs in the same system as the original conduit run display for selection.

Specification

Specify the active conduit specification for the branch feature. All conduit specifications that are allowed for the system parent of the conduit run display for selection. If appears in the box, the conduit specification is inherited from the conduit run to which the branch feature belongs. If the icon does not appear and you want to use the conduit specification from the run, select **Use Run Specification**.

Nominal Conduit Diameter

Specifies the nominal diameter (NCD) of the object. If displays in the box, the NCD for the object is inherited from the parent object to which the object belongs. If the icon does not

display, and you need to use the parent object specification from the parent object run, select **Use Run NCD**. If you have manually selected the part, the NCD of the selected part displays, and you cannot change it.

Type

Displays the types of branch features allowed by the selected **Specification** and **Nominal Conduit Diameter**. Branch features are listed by short codes. You can change the branch feature type if needed. If you have manually selected the part, this box displays **Part selected manually** and cannot be changed.

Option

Displays a list of available branch features. The software generates this list based on the conduit specification, the NCD, and the short code that you selected in the **Type** box. If you have manually selected the part, this box displays **Part selected manually** and cannot be changed.

Base Part Name

Displays the part name for the branch feature. The software selects the part number using the conduit specification guidelines. Click **Select Manually** to override the conduit specification, and select the part number from the catalog. If you select a part manually, the **Nominal Conduit Diameter**, **Type** and **Option** properties are disabled.

Fill Information

Percent Fill

Displays or defines the percent cable fill in the conduit feature.

Conduit Component Properties Dialog Box

Displays conduit component properties for review and editing.

See Also

General Tab (Conduit Component Properties Dialog Box) (on page 115) Configuration Tab (on page 275) Relationship Tab (on page 278) Notes Tab (on page 277) Connections Tab (on page 277) Edit Component Properties (on page 187)

General Tab (Conduit Component Properties Dialog Box)

Displays and defines the general properties of the conduit component.

Standard

System

Displays the system to which the conduit component belongs. You cannot change the system of the conduit component.

Conduit Run

Specifies the conduit run to which the conduit component belongs. Other runs in the same

system as the original conduit run display for selection.

Specification

Specify the active conduit specification for the conduit component. All conduit specifications that are allowed for the system parent of the conduit run display for selection. If appears in the box, the conduit specification is inherited from the conduit run to which the component belongs. If the icon does not appear, and you want to use the conduit specification from the run, select **Use Run Specification**.

Nominal Conduit Diameter

Specify the nominal diameter (NCD) of the conduit component. If appears in the box, the NCD for the conduit component is inherited from the conduit run to which the conduit component belongs. If the icon does not appear, and you want to use the conduit specification from the conduit run, select **Use Run NCD**. If you have manually selected the part, the NCD of the selected part appears and cannot be changed.

Type

Displays the types of conduit components allowed by the selected **Specification** and **Nominal Conduit Diameter**. Conduit components are listed by short codes. You can change the conduit component type if needed. If you have manually selected the part, this box displays **Part selected manually** and cannot be changed.

Option

Displays a list of available conduit components. The software generates this list based on the conduit specification, the NCD, and the short code that you selected in the **Type** box. If you have manually selected the part, this box displays **Part selected manually** and cannot be changed.

Base Part Name

Displays the part name for the conduit component. The software selects the part number using the conduit specification guidelines. Click **Select Manually** to override the conduit specification, and select the part number from the catalog. If you select a part manually, the **Nominal Conduit Diameter**, **Type** and **Option** properties are disabled.

Fill Information

Percent Fill

Displays or defines the percent cable fill in the conduit component.

Conduit End Feature Properties Dialog Box

Sets options for a conduit end feature that you have selected.

See Also

Configuration Tab (on page 275)

Edit Conduit End Feature Properties (on page 162)

General Tab (Conduit End Feature Properties Dialog Box) (on page 117)

Relationship Tab (on page 278)

General Tab (Conduit End Feature Properties Dialog Box)

Displays and defines the general properties of the selected conduit end feature.

Standard

System

Displays the system to which the end feature belongs. You cannot change the system of the end feature.

Conduit Run

Displays the conduit run to which the end feature belongs.

Specification

Displays the active conduit specification for the end feature.

Nominal Conduit Diameter

Displays the nominal diameter (NCD) of the end feature. If appears in the box, the NCD for the end feature is inherited from the conduit run to which the end feature belongs.

Type

Displays the types of end features allowed by the selected **Specification** and **Nominal Conduit Diameter**. End features are listed by short codes. You can change the end feature type if needed. If you have manually selected the part, this box displays **Part selected manually** and cannot be changed.

Option

Displays a list of available end features. The software generates this list based on the conduit specification, the NCD, and the short code that you selected in the **Type** box. If you have manually selected the part, this box displays **Part selected manually** and cannot be changed.

Base Part Name

Displays the part name for the end feature. The software selects the part number using the conduit specification guidelines.

Conduit Part Properties Dialog Box

Displays conduit part properties for review and editing.

Connections Tab (on page 277) Relationship Tab (on page 278) Configuration Tab (on page 275) Notes Tab (on page 277)

Conduit Run Properties Dialog Box

Displays conduit run properties for review and editing.

See Also

Edit Conduit Run Properties (on page 161)

General Tab (Conduit Run Properties Dialog Box)

Displays and defines the general properties of the selected conduit.

NOTE Because conduit run properties are customizable in the reference data, only the properties that are required by the software are documented.

Conduit run properties are divided into several different categories: **Standard**, **Surface Treatment and Coating**, **Cable Fill**, and **Responsibility**. You select which category that you want to define values for by using the **Category** option.

Standard

System

Displays or defines the system for the conduit. The last system that you selected is the default. Select **More** to display all defined systems. You can create a new system in the Systems and Specifications task.

Name

Displays or defines the name of the conduit that you are creating. The name is based on the **Name Rule** selection. If you want to type a new name for the run, in the **Name Rule** box, select **User Defined**, and then type a name for the run in the **Name** box.

Name Rule

Specify the naming rule that you want to use to name this run. You can select one of the listed rules or select **User Defined** to specify the run name yourself in the **Name** box.

Specification

Displays or defines the specification for the conduit. Specifications are assigned to systems in the Systems and Specifications task. Only those specifications that are allowed in the system that you selected appear. You define specifications in the reference data.

Nominal Conduit Diameter

Displays or defines the conduit diameter. The specification controls the available NPDs in this list. Select the nominal pipe diameter (NPD) that you want to use for this run. If you select a nozzle as the starting point of your conduit run, the software automatically uses the NPD of the nozzle as the NPD of the conduit run.

Surface Treatment and Coating

Interior Surface Treatment Type

Select the type of interior surface treatment for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Interior Surface Treatment** sheet in the **AllCodeLists.xls** workbook in the reference data.

Interior Surface Treatment Requirement

Select the interior surface treatment requirement for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Interior Surface Treatment** sheet in the **AllCodeLists.xls** workbook in the reference data.

Exterior Surface Treatment Type

Select the type of exterior surface treatment for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Exterior Surface Treatment** sheet in the **AllCodeLists.xls** workbook in the reference data.

Exterior Surface Treatment Requirement

Select the exterior surface treatment requirement for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Exterior Surface Treatment** sheet in the **AllCodeLists.xls** workbook in the reference data.

Cleaning Requirement

Select the cleaning requirement for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Cleaning Requirement** sheet in the **AllCodeLists.xls** workbook in the reference data.

Steamout Requirement

Select the steamout requirement for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Steamout Requirement** sheet in the **AllCodeLists.xls** workbook in the reference data.

Steamout Pressure

Specify the steamout pressure for the conduit. Include the pressure unit of measure, psi for pounds per square inch for example, when specifying this value.

Steamout Temperature

Specify the steamout temperature for the conduit. Include the temperature unit of measure, K for Kelvin, F for Fahrenheit, or C for Celsius for example, when specifying this value.

Interior Coating Requirement

Select the coating requirement of the interior coating for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Interior Coating Type

Select the type of interior coating for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Interior Coating Area

Enter the total area that the interior coating covers.

Exterior Coating Requirement

Select the coating requirement of the exterior coating for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Exterior Coating Type

Select the type of exterior coating for the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Coating Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Exterior Coating Area

Enter the total area that the exterior coating covers.

Coating Color

Select the color of the conduit coating. If you want to add, edit, or remove values that are available for selection, edit the **Coating Color** sheet in the **AllCodeLists.xls** workbook in the reference data.

Cable Fill

Fill Efficiency

Displays or defines the efficiency of the stacking of cables in the conduit. You can enter a real number, integer, or percent; for example, type 0.9, 90, or 90%.

Signal Type

Displays or defines the cable usage, which is used in tray fill calculations. If you want to add, edit, or remove values that are available for selection, edit the **Signal Type** sheet in the **AllCodeLists.xls** workbook in the reference data.

Voltage Grade

Displays or defines the voltage grade, which is used in determining the range of voltage that the conduit can carry. If you want to add, edit, or remove values that are available for selection, edit the **Voltage Grade** sheet in the **AllCodeLists.xls** workbook in the reference data.

Responsibility

Cleaning Responsibility

Select the party responsible for cleaning the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Cleaning Responsibility** select list in the Catalog task.

Design Responsibility

Select the party responsible for designing the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Design Responsibility** select list in the Catalog task.

Fabrication Responsibility

Select the party responsible for fabricating the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Fabrication Responsibility** select list in the Catalog task.

Installation Responsibility

Select the party responsible for installing the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Installation Responsibility** select list in the Catalog task.

Painting Responsibility

Select the party responsible for painting the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Painting Responsibility** select list in the Catalog task.

Requisition Responsibility

Select the party responsible for ordering the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Requisition Responsibility** select list in the Catalog task.

Supply Responsibility

Select the party responsible for delivering the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Supply Responsibility** select list in the Catalog task.

Testing Responsibility

Select the party responsible for testing the conduit. If you want to add, edit, or remove values that are available for selection, edit the **Testing Responsibility** select list in the Catalog task.

Conduit Straight Feature Properties Dialog Box

Displays straight feature properties for review and editing.

See Also

Configuration Tab (on page 275)
Relationship Tab (on page 278)
Edit Conduit Straight Feature Properties (on page 162)
General Tab (Cableway Straight Feature Properties Dialog Box) (on page 77)
General Tab (Conduit Straight Feature Properties Dialog Box) (on page 121)

General Tab (Conduit Straight Feature Properties Dialog Box)

Displays and defines the general properties of the selected conduit straight feature.

Standard

System

Displays the system to which the straight feature belongs. You cannot change the system of the straight feature.

Conduit Run

Specifies the conduit run to which the straight feature belongs. Other runs in the same system as the original conduit run display for selection.

Specification

Specify the active conduit specification for the straight feature. All conduit specifications that are allowed for the system parent of the conduit run display for selection. If appears in the box, the conduit specification is inherited from the conduit run to which the straight feature belongs. If the icon does not appear and you want to use the conduit specification from the conduit run, select **Use Run Specification**.

Nominal Conduit Diameter

Specify the nominal diameter (NCD) of the straight feature. If displays in the box, the NCD for the straight feature is inherited from the conduit run to which the straight feature belongs. If the icon does not display, and you want to use the conduit specification from the conduit run, select **Use Run NCD**. If you have manually selected the part, the NCD of the selected part displays and you cannot change it.

Type

Specifies the types of straight features allowed by the selected **Specification** and **Nominal Conduit Diameter**. Straight features are listed by short codes. You can change the straight feature type if needed. If you have manually selected the part, this box displays **Part selected manually** and cannot be changed.

Option

Displays a list of available straight features. The software generates this list based on the conduit specification, the NCD, and the short code that you selected in the **Type** box. If you have manually selected the part, this box displays **Part selected manually** and cannot be changed.

Base Part Name

Displays the part name for the straight feature. The software selects the part number using the conduit specification guidelines. Click **Select Manually** to override the conduit specification, and select the part number from the catalog. If you select a part manually, the **Nominal Conduit Diameter**, **Type** and **Option** properties are disabled.

Length

Displays the length of the straight feature. You cannot change the length of the straight feature.

Fill Information

Percent Fill

Displays or defines the percent cable fill in the conduit feature.

Conduit Turn Feature Properties Dialog Box

Displays turn feature properties for review and editing.

See Also

Configuration Tab (on page 275)
Relationship Tab (on page 278)
Edit Conduit Turn Feature Properties (on page 162)
General Tab (Cableway Turn Feature Properties Dialog Box) (on page 82)
General Tab (Conduit Turn Feature Properties Dialog Box) (on page 123)

General Tab (Conduit Turn Feature Properties Dialog Box)

Displays and defines the general properties of the selected conduit turn feature.

Standard

System

Displays the system to which the turn feature belongs. You cannot change the system of the turn feature.

Conduit Run

Specifies the conduit run to which the turn feature belongs. Other runs in the same system as the original conduit run display for selection.

Specification

Specify the active conduit specification for the turn feature. All conduit specifications that are allowed for the system parent of the conduit run display for selection. If appears in the box, the conduit specification is inherited from the conduit run to which the turn feature belongs. If the icon does not appear and you want to use the conduit specification from the conduit run, select **Use Run Specification**.

Nominal Conduit Diameter

Specify the nominal diameter (NCD) of the turn feature. If appears in the box, the NCD for the turn feature is inherited from the conduit run to which the turn feature belongs. If the icon does not appear, and you want to use the conduit specification from the conduit run, select **Use Run NCD**. If you have manually selected the part, the NCD of the selected part appears and cannot be changed.

Type

Displays the types of turn features allowed by the selected **Specification** and **Nominal Conduit Diameter**. Turn features are listed by short codes. You can change the turn feature type if needed. If you have manually selected the part, this box displays **Part selected manually** and cannot be changed.

Option

Displays a list of available turn features. The software generates this list based on the conduit specification, the NCD, and the short code that you selected in the **Type** box. If you have manually selected the part, this box displays **Part selected manually** and cannot be changed.

Base Part Name

Displays the part name for the turn feature. The software selects the part number using the conduit specification guidelines. Click **Select Manually** to override the conduit specification, and select the part number from the catalog. If you select a part manually, the **Nominal Conduit Diameter**, **Type** and **Option** properties are disabled.

Fill Information

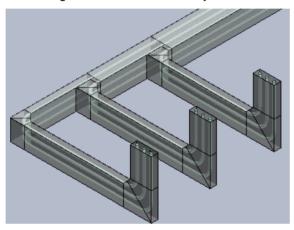
Percent Fill

Displays or defines the percent cable fill in the conduit feature.

SECTION 5

Routing Duct Banks

A duct bank is a casing that encloses conduit runs. The enclosing run becomes a cableway which does not have parts. However, conduits parts are available for the enclosed conduits. Duct banks can be logically connected with other duct banks of similar cross-section. They can also logically connect with zero-spec cableway runs. Duct banks do not form transitions. The connecting cableways always form the transition. You can route cables out of networks containing duct banks or cableways. You cannot multi-route duct banks.



By default, the software uses fast mode during routing, which means that you do not see elbows or turns during the dynamic placement display. After you define the run location, the software displays the elbows. Press SHIFT+F to toggle fast mode on and off.

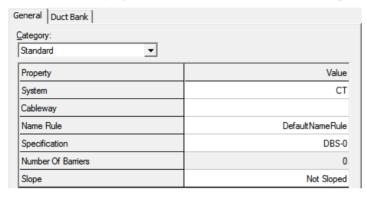
What do you want to do?

- Route duct bank (on page 126)
- Route a sloped duct bank (on page 127)
- Copy a duct bank (on page 129)
- Branch duct banks (on page 128)
- Move duct bank (on page 150)
- Delete conduit from duct bank (on page 155)
- Change duct bank turn angle (on page 129)
- Extend or shorten duct bank (on page 130)
- Delete a duct bank (on page 155)

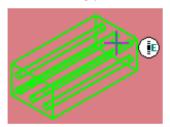
Route duct bank

- 1. Click Route Cableway 7.
- 2. Click in the graphic view to select a starting point for the duct bank.
- 3. On the **New Cableway** dialog box, select a **Duct Bank Specification** such as the delivered **DBS-0**. For more information, see *New Cableway Dialog Box* (on page 61).

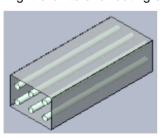
The software displays a new **Duct Bank** tab in the dialog box.



- 4. On the Duct Bank tab, set the Duct Bank properties.
- 5. Click **OK** to close the dialog box.
- 6. Click in the graphic view to define the route of your duct bank.
 - TIP You can use PinPoint, Point Along, and the SmartSketch3D relationship indicators when defining your duct bank.



7. Right-click to end routing of the duct bank.



Route a sloped duct bank

- 1. Click Route Cableway #.
- 2. Click to select a starting point in the graphic view to route a new duct bank.
- 3. On the **New Cableway** dialog box, select a system.
- 4. In the **Specification** box, select a duct bank specification such as the delivered DBS-0. When you select a duct bank specification, the **Slope** property is available.
- 5. Specify slope for the duct bank.
- 6. On the **Duct Bank** tab, set the duct bank properties as needed.
- 7. Click OK.

Specify Slope Direction dialog box displays.

- 8. In the **Specify Slope Direction** dialog box, specify if you are routing from the high point or the low point of the duct bank. For more information, see *Specify Slope Direction Dialog Box (Duct Bank)* (on page 130).
- 9. Click in a graphic view to route the duct bank as needed.
- 10. Right-click to end routing.

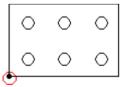
TIPS

- You can use **PinPoint** Point Along , and the SmartSketch3D relationship indicators when routing the duct bank.
- You can unlock the slope on the ribbon bar to temporarily override the slope. For example, to model a vertical top in the duct bank you need to unlock the slope.

Modify a duct bank

- 1. Click Select .
- 2. Select Enclosing Runs in the Locate Filter box.
- 3. Select the duct bank to modify.
- 4. On the ribbon bar, click **Properties**
- 5. On the **Duct Bank** tab, click **Add Conduit Run** to add another conduit.

The software adds a conduit run named **AddedRun<N>** to the duct bank at 0x0 position. You can see the preview of the conduit run and its position.



6. To change the position of the new conduit run, modify the **Distance Along Width Direction** and **Distance Along Depth Direction** as required.

- TIP If the new position is outside the cross section, click Resize to adjust the cross section
- 7. Click **OK** to confirm the changes and close the dialog box.

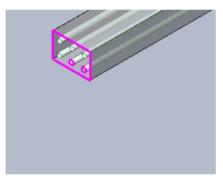
TIPS

- To revert the changes, click **Go To Defaults (**, or click **Cancel**.
- To delete a conduit, click Delete X.

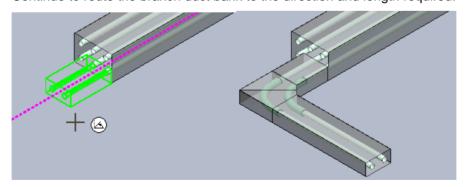
Branch duct banks

- 1. Click Select &.
- 2. Select CableWay/Conduit Path Features in the Locate Filter box.
- 3. From an existing duct bank, select the conduit end features that you want to branch and the enclosing duct bank end-feature.

■ NOTE We recommend that you fence select and then remove the conduits that are not needed. To remove the extra conduits, hold down CTRL and then select the conduit end features.



- 4. Click Route Cableway 7.
- 5. In the *New Cableway Dialog Box* (on page 61), make any changes to the conduits you are branching, and then click **OK**.
- 6. Continue to route the branch duct bank to the direction and length required.



■ NOTE When you branch away from the main duct bank, you can select one or more conduits. To successfully branch the duct bank, be sure to select only the end features of the objects that you want to extend.

Copy a duct bank

- 1. Click Select &.
- 2. Select Enclosing Runs in the Locate Filter box.
- 3. Select the duct bank to copy.
- 4. On the Common ribbon bar, click **Copy a**.
- 5. Select a reference point.
- 6. On the Common ribbon bar, click Paste 🖺.
- 7. Select **Move** \$\psi\$ from the main ribbon.
- 8. Identify a location in the model for the duplicated duct bank.

 The software copies the duplicate duct run to the specified location.

Change duct bank turn angle

- 1. Click Select &.
- 2. Select CableWay/Conduit Path Features in the Locate Filter box.
- 3. Select all the conduit end-features and the enclosing duct bank end-feature to move.
- 4. Click **Move** * on the toolbar.
- 5. Click on the highlighted run.
- 6. Identify the point in the model and click in the graphic view.

■ NOTE To change the angles of the turns, either select all the conduits or select only the conduits to change. Then move the conduits using **Move** * to achieve the new angle.

Extend or shorten duct bank

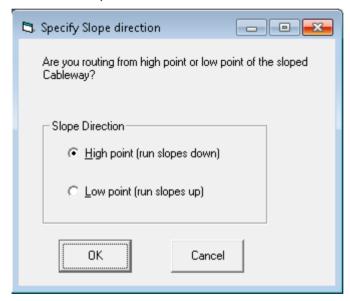
- 1. Click Select .
- 2. Select Enclosing Runs in the Locate Filter box.
- 3. Click **Move** � on the main ribbon.
- 4. Click a location on the duct bank to use as the move-from location.
- 5. Identify the move-to location by clicking in the model.

TIPS

- Be sure to select only the end features.
- You can also extend or shorten the duct bank by modifying the length of Enclosing Cableway End Feature.

Specify Slope Direction Dialog Box (Duct Bank)

Defines the slope direction of a new duct bank.



High Point

Select to indicate that the duct bank end point is the highest point on the duct bank.

Low Point

Select to indicate that the duct bank end point is the lowest point on the duct bank.

See Also

Route a sloped duct bank (on page 127)

Select Insulation Material Dialog Box

Specifies the insulation materials for a selected object. By browsing through the part hierarchy, you can find and select an insulation material in the Catalog database.

■ Save

This option is unavailable.

Cut

This option is unavailable.

陷 Сору

This option is unavailable.

Paste

This option is unavailable.

X Delete

This option is unavailable.

Undo

This option is unavailable.

Insert Row

This option is unavailable.

1 Move Up

This option is unavailable.

I Move Down

This option is unavailable.

Properties

Displays the properties of the selected object. Because you cannot modify any properties until the object is placed, all properties on the **Properties** dialog box are read-only.

Preview

Displays a bitmap symbol of the selected object. The image file must be assigned to the object in the catalog reference data.

Filter

This option is unavailable.

2 ↓ Sort

This option is unavailable.

Customize Current View

This option is unavailable.

List View

Sets the dialog box to display insulation thickness values in a list view.

Grid View

Sets the dialog box to display insulation thickness values in a spreadsheet-style grid view.

Returns you to the previously selected insulation material folder. Use this command to navigate through the hierarchy to the specific insulation material you need.

Forward

Sends you to the last selected insulation material folder that you moved away from by using the **Back** button. Use this command to navigate through the hierarchy to the specific insulation material you need.

Up One Level

Brings up the next highest level of the hierarchy. Use this command to navigate through the hierarchy to the specific material you need.

Check Data

This option is unavailable.

CheckData Ignored Inconsistencies

This option is unavailable.

Smart 3D Help

This option is unavailable.

Address

Sets the current location within the hierarchy of available insulation materials. The dropdown box lists the folders you have visited.

SECTION 6

Route Selection Commands

Route targeted commands allow you to select part of a route network to modify. With the **Get Features** commands you can select a targeted route network using one or more features on that network. The **Get Connected Supports** command allows you to select connected supports of a feature. To select only the runs associated with a feature in a specific route network, use the **Get Runs** command.

★ IMPORTANT

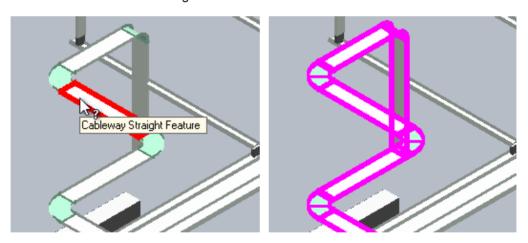
- You must select Cableway Features or Conduit Features option in the Locate Filter.
- Get Features commands do not support combining features from different tasks. For example, you cannot have Piping and Electrical, or Electrical and HVAC features in a combination.

Get Features Commands

Contains a group of commands that allow you to select part of a targeted route network. The **Get Features** commands apply to features that are in the select set and are defined in the Workspace. You can select one or more features on the network. You can also use a combination of the following commands to extend the targeted network as necessary.

On Same Run

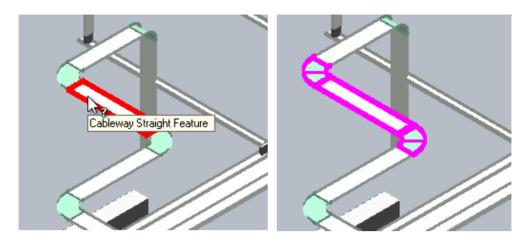
Selects all features that belong to a same run even if the run is discontinued.



On Same Leg

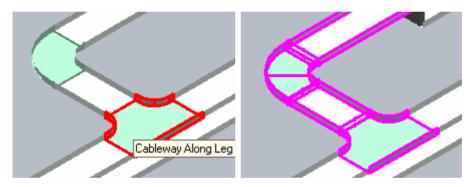
Selects all features that belong to the same leg. The software also includes the along-leg feature if the selected leg is a branch.

NOTE A leg is a group of route features routed in the same direction.



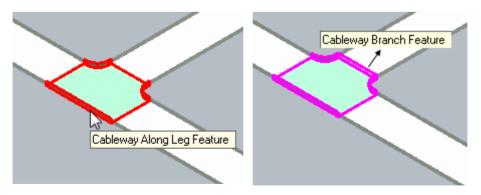
On All Connected Branches

Selects all features associated with the connected branches. Select an along-leg feature that has a branch connected to it. Right-click the along-leg feature, and select **On All Connected Branches.** The software selects the associated features connected to the branch run until it branches into a header run, or until a free end is traversed.



For Connected Fittings

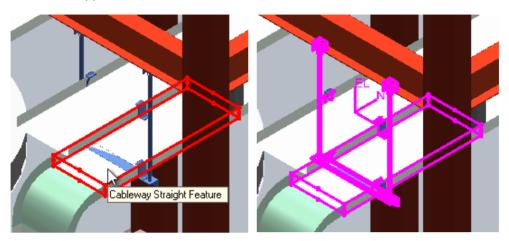
Adds the immediate connected fittings to the selection. You must select a branch component.



TIP You can select a leg using On Same Leg, and then use For Connected Fittings to add all the adjacent branch fittings on that leg to the selection.

Get Connected Supports

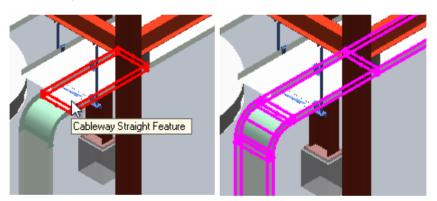
Selects all supports connected to the selected feature.



NOTE This command does not support duct banks and cable tray barriers. However, you can select a barrier in a cable tray, or a conduit in duct bank.

Get Runs

Selects only the runs associated with the selected feature or features.



NOTE This command does not support duct banks and cable tray barriers. However, you can select a barrier in a cable tray, or a conduit in duct bank.

Get Continuously Connected

Selects the feature and all features that are continuously connected to that feature.



SECTION 7

Move Route Objects

After you complete a cableway or conduit run, you can move the run features to alter the route, connection points, or component placement.

You can move route objects by selecting one or more features using **Move** \circledast on the main ribbon bar, or using the **Move From** and **Move To** commands on the modify feature ribbon bar. We recommend that you use **Move** \circledast to move large sections of network to maintain the connectivity. Use **Move From** and **Move To** to move a feature.

You can only move a route object if:

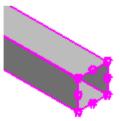
- you have Full Control or Write access to the permission group the object belongs to,
- the object's Approval Status is Working.

You can move the following types of features:

Straight Features

- Moving a straight feature moves the entire leg to which the feature is connected.
- The move direction is always perpendicular to the axis of the straight feature.
- A branch feature connected to the moved leg maintains its original angle.
- Movement stops when parts on the associated leg overlap, or when they overlap with adjacent parts on connected legs.
- When equipment moves, the leg moves with the equipment nozzle to remain collinear with the nozzle as much as possible.

To move straight features, select one of the orientation handles the software displays at the ends of the straight feature. This is the move-from point. The orientation handles allow you to move the feature in relation to the edge instead of the centerline. For example, use the orientation handles to align the bottom of a beam with the top of a beam.



Turn Features

- If you move a turn to a position where two adjacent legs are collinear (that is, the turn reaches 180 degrees), the software deletes the turn.
- The turn stops moving when it starts to overlap with an adjacent along-leg feature.

End Features

- Moving the end feature changes the length of the straight feature.
- Moving the end feature modifies the topology of the turn feature if it is connected to another leg. The default motion plane is the connected turn feature or along-leg feature.
- You cannot move an end feature that is connected to a nozzle.
- You cannot move the end feature past the point where the straight feature length becomes zero, such as the point where an end feature touches a nozzle or a free port of another feature.

Branch Features

- If the branch and header are in the motion plane, the branch feature moves along the branch leg.
- If the branch and header are not in the motion plane, the end of the branch leg and branch feature move to keep the branch angle constant.
- You can move the branch feature along the associated straight feature. As you move the feature, the software dynamically displays the angle between the branch feature and the branch leg.

Along-Leg Features

- You can move along-leg features along the straight feature on which you placed them. The software prevents you from moving the along-leg feature past the end of the run, or to a position that would cause parts to overlap.
- Along-leg features that are not branches maintain a constant distance from the fixed end of the leg.
- If an along-leg features such as an elbow or a transition is located at an end of the run, you can move the run using **Move** ♣. You need not select the end feature to move.
- You can move features only after you finish routing a run and placing components. Edit
 commands are not available until you complete routing or placement. You complete routing
 by right-clicking or by pressing Esc.

Boundary Connections

When you move cable trays or conduits at boundary connections, the software modifies the associated network. For more information, see *Appendix: Moving at Boundary Connections* (on page 284).

What do you want to do?

- Move a cableway run (on page 139)
- Move a straight cableway feature (on page 140)
- Move a cableway turn (on page 141)
- Move a cableway branch (on page 139)
- Move a transition (on page 142)
- Move duct bank (on page 150)

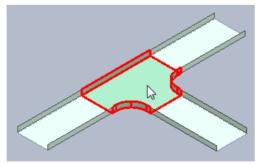
- Move a conduit run (on page 143)
- Move a straight conduit (on page 144)
- Move a conduit turn (on page 147)
- Move a conduit branch (on page 148)
- Move a conduit end (on page 149)
- Move a component (see "Move a cableway component" on page 185)
- Move a cable marker (on page 237)

Move a cableway run

- 1. Click Select &.
- 2. Select Cableways in the Locate Filter box.
- 3. Select the cableway run to move.
- 4. Select **Move** $ext{$\oplus$}$ on the main ribbon.
- 5. Select the run, or click in a graphic view to select the move-from location.
 - TIP Use the end of the run as the move-from location if you are trying to connect the run to a nozzle or another run.
- 6. Identify the move-to location in the model by clicking in a graphic view.
- **NOTE** For more information on how the software performs the move operation, refer *Appendix: Moving at Boundary Connections* (on page 284).

Move a cableway branch

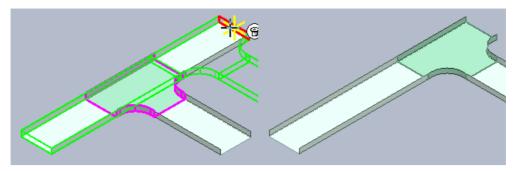
- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the branch that you want to move.



- 4. Click **Move To**

 on the ribbon. If you do not define a starting point by using the **Move**From

 note, the software assumes that the current location of the object is the starting point.
- 5. Move the branch to the new location.



NOTE For more information on how the software perfroms the move operation at boundary connections, see *Appendix: Moving at Boundary Connections* (on page 284).

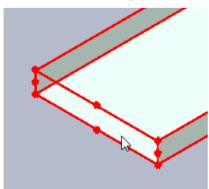
Move a straight cableway feature

- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the cableway feature that you want to move.
- 4. Set the Lock Length A as needed.
- 5. Select the cableway.
- 6. Click **Move To**

 on the ribbon. If you do not define a starting point using **Move From**on the software assumes that the current location of the object is the starting point.
- 7. Move the cableway to the new location.

■ NOTES

- For more information on how the software perfroms the move operation, see *Appendix: Moving at Boundary Connections* (on page 284).
- When you move a straight feature, the default working plane is the plane of one of the adjacent turns. The software selects the turn first by the plane that includes branches, and then by the plane of larger nominal diameter.
- You can select one of the orientation handles displayed at the ends of the straight feature as the move-from point. These orientation handles allow you to move the feature in relation to the edge instead of the centerline. For example, you can use the orientation handles to align the bottom with the top of a beam.



Move a set of cableway features

- 1. Click **Select** on the vertical toolbar.
- 2. In the Locate Filter, select Cableway Features.
- 3. Select a feature on the cableway section to move.
- 4. Right-click the feature, and select an option under **Get Features**. For more information, see *Route Selection Commands* (on page 133).
- 5. Click **Move** � on the main ribbon.
 - TIP If you move the cableway end within ¼ inch (6.35 mm) of another cableway end, the software automatically connects the two ends.
- 6. Select a move-from point.
- 7. Identify the move-to point, and click the graphic view to confirm the new location.

The software moves the cableway run to the new location.

NOTE For more information on how the software performs the move operation, see *Appendix: Moving at Boundary Connections* (on page 284).

Connect a Set of Cableway Features

- 1. Click **Select** on the vertical toolbar.
- 2. In the Locate Filter, select Cableway Features.
- 3. Select a feature in the cableway section to modify.
- Right-click the feature, and select an option under Get Features. For more information, see Route Selection Commands (on page 133).
- 5. Click **Move** $ext{$\phi$}$ on the main ribbon.
- 6. Click an end feature in the selection.
- 7. To connect the selection to another cableway inline, click an open end feature.

-OR-

To connect the selection to another cableway at a branch point, click a straight feature.

■ NOTE The software will lengthen or shorten the cableway length as needed to make the connection. For more information, see *Connecting cable trays or cableways using Move* (on page 284).

Move a cableway turn

- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the turn to move.
- 4. Click **Move To**

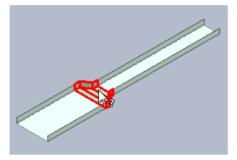
 on the ribbon. If you do not define a starting point by using **Move From**on the software assumes that the current location of the object is the starting point.

5. Move the turn to the new location. You can use the **Angle** box to type a new angle for the turn

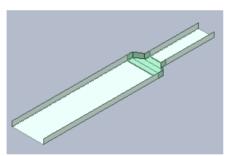
The software moves the turn along the cableway to the specified angle.

Move a transition

- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the transition that you want to move.



- 4. Click on the transition.
- 5. On the edit cableway ribbon bar, click **Move To** .
- 6. Move the transition to the new location, and click to place the transition.

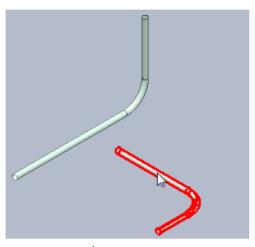


• TIP You can use the **Point Along**

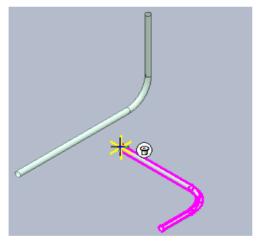
✓ and **PinPoint** commands to locate the transition precisely.

Move a conduit run

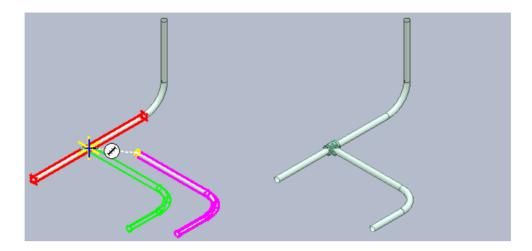
- 1. Click Select &.
- 2. In the Locate Filter, select Conduit Runs.
- 3. Select the conduit run to move.



- 4. Select **Move** � on the main ribbon.
- 5. Select a location either on the conduit run or in the model to use as the move-from location. Use the end of the conduit run as the move-from location if you are trying to connect the conduit run to a nozzle or another conduit run.

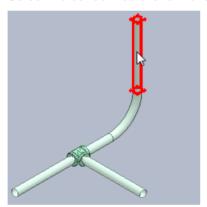


6. Identify the move-to location in the model.



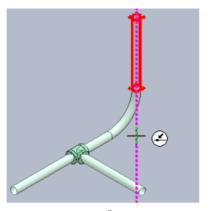
Move a straight conduit

- 1. Click Select .
- 2. Select Conduit Features in the Locate Filter box.
- 3. Select the conduit feature to move.

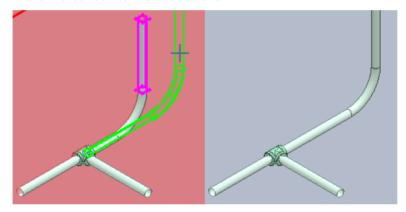


4. Set the **Lock Length** A as needed.

5. Click **Move From** on the ribbon, and select the starting point of the move. The software assumes that the current location of the object is the starting point if you do not define one.

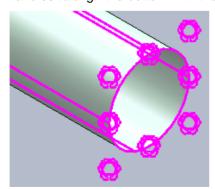


- 6. Click **Move To** \nearrow on the ribbon.
- 7. Move the conduit to the new location.



■ NOTES

- When you move a straight feature, the default working plane is the plane of one of the adjacent turns. The software selects the turn first by the plane that includes branches, and then by the plane of larger nominal diameter.
- You can select one of the orientation handles that are displayed at the ends of the straight feature as the move from point. These orientation handles allow you to move the feature in relation to the edge instead of the centerline. For example, you can use the orientation handles to align the bottom with the top of a beam.



Move a set of conduit features

- 1. Click **Select** on the vertical toolbar.
- 2. In the Locate Filter, select Conduit Features.
- 3. Select a feature on the conduit section to move.
- 4. Right-click the feature, and select an option under **Get Features**. For more information, see *Route Selection Commands* (on page 133).
- 5. Click **Move** � on the main ribbon.
 - \ref{TIP} If you move the conduit end within \ref{M} inch (6.35 mm) of another conduit run end, the software automatically connects the two ends.
- 6. Select a move-from point.
- 7. Identify the move-to point, and click the graphic view to confirm the new location.

The software moves the conduit run to the new location.

NOTE For more information on how the software performs the move operation, see *Appendix: Moving at Boundary Connections* (on page 284).

Connect a Set of Conduit Features

- 1. Click **Select** on the vertical toolbar.
- 2. In the Locate Filter, select Conduit Features.
- 3. Select a feature in the conduit section to modify.
- 4. Right-click the feature, and select an option under **Get Features**. For more information, see *Route Selection Commands* (on page 133).
- 5. Click **Move** � on the main ribbon.
- 6. Click an end feature in the selection.
- 7. To connect the selection to another conduit inline, click an open end feature.

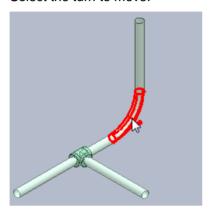
-OR-

To connect the selection to another conduit at a branch point, click on a straight feature.

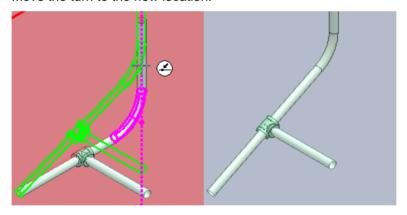
NOTE The software will lengthen or shorten the conduit run length as needed to make the connection. For more information, see *Connecting conduit runs using Move* (on page 288).

Move a conduit turn

- 1. Click Select .
- 2. Select Conduit Features in the Locate Filter box.
- 3. Select the turn to move.

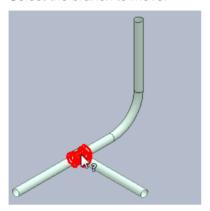


- 4. Click **Move To** \nearrow on the ribbon.
 - **? TIP** If you do not define a starting point by using **Move From** ▶, the software assumes that the current location of the object is the starting point.
- 5. Move the turn to the new location.

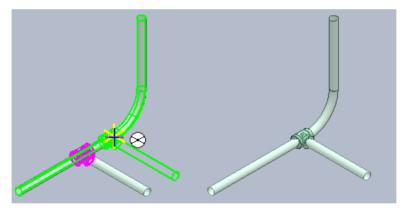


Move a conduit branch

- 1. Click Select .
- 2. Select Conduit Features in the Locate Filter box.
- 3. Select the branch to move.

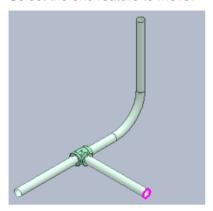


- 4. Click **Move To** \nearrow on the ribbon.
 - **? TIP** If you do not define a starting point by using **Move From** ♣, the software assumes that the current location of the object is the starting point.
- 5. Move the branch to the new location.

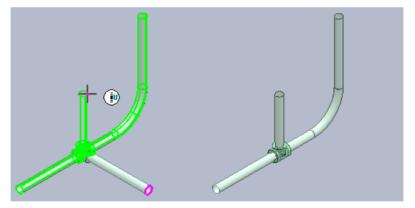


Move a conduit end

- 1. Click Select .
- 2. Select Conduit Features in the Locate Filter box.
- 3. Select the end feature to move.



- TIP Make sure that you select the end feature as shown.
- 4. Click **Move To** \nearrow on the ribbon.
- 5. Move the conduit end to the new location. You can also use the **Length** box to type a new length for the conduit.



Move duct bank

You can move a duct bank as a whole or you can move selected sections.

To move a whole duct bank

- 1. Click Select .
- 2. Select Enclosing Runs in the Locate Filter box.
- 3. Click **Move** � on the main ribbon.
- 4. Select a location on the duct bank to use as the move-from location.
- 5. Identify the move-to location by clicking in the model.

To move a duct bank selection

- 1. Click Select .
- 2. Select CableWay/Conduit Path Features in the Locate Filter box.
- 3. Select the features you want to move.
 - NOTE You can use QuickPick and CTRL to make your selection.
- 4. Click **Move** � on the main ribbon.
- 5. Click in your selection to identify the move-from location.
- 6. Click in the model to identify the move-to location.

SECTION 8

Delete Route Objects

You can delete route objects to remove unwanted objects. You cannot delete parts directly. When you delete any route object, the software attempts to maintain the design integrity of the model by deleteing connections, mating parts, and adjusting all previously connected features.

★ IMPORTANT

- You cannot delete a route object in non-working approval status, such as Approved, In Review, and Rejected.
- You can delete a route object only if it is in working state. In a Global Workshare Configuration, if you delete an object at your location that is connected to an object at a different location, the software generates a To Do Record to delete connections. You must have Write access to update the To Do Record.
- When you delete a route object connected to an object in working approval status, the software does not delete the connection and its associated system-generated parts such as mating parts or transitions. The software generates a To Do Record for that part. You must have Write access to update the To Do Record.

The behavior of various objects during deletion is detailed below:

Cableway, Conduit, and Cable Runs

- Deleting the run deletes all features (and thereby all parts) belonging to the run.
- The software cuts the run legs at all boundaries and creates gaps. The software neither extends nor inserts a straight feature.
- When a parallel cable is deleted, all of its children paralleled cables are deleted as well. A
 paralleled cable can be deleted without affecting its parent or siblings.

Straight Features

- The straight feature connected by the associated turn feature is extended to the turn point.
- Deleting a straight feature does not delete any adjacent branch features if the straight feature is connected to the branch port of the feature. For tee-type branches, the software replaces the header portion of the deleted branch feature with a straight feature.
- If the straight feature connects to a component, the software does not delete the component when the straight feature is deleted.

Turn Features

- Straight features connected to the deleted turn extend to the turn point.
- Deleting a turn feature does not remove all adjacent run change features and mating parts.
- When a branch feature is adjacent to the turn feature, the software inserts a straight feature to avoid deleting a branch.

Inline Components or Split Features

 If an inline component is deleted, the software merges the two connected straight features, forming one straight feature, provided they share the same parent run and the same dimensions.

Boundary Connections

When you delete route objects at boundary connections, the software deletes all associated boundary connections with few exceptions related to permission groups, approval status and Global Workshare configuration. For more information, see *Appendix: Deleting at Boundary Connections* (on page 296).

What do you want to do?

- Delete a cableway run (on page 152)
- Delete a straight cableway feature (on page 153)
- Delete a cableway turn (on page 154)
- Delete a cableway branch (on page 153)
- Delete a cableway transition (on page 154)
- Delete a duct bank (on page 155)
- Delete a conduit run (on page 154)
- Delete a straight conduit (on page 154)
- Delete a conduit turn (on page 155)
- Delete a conduit branch (on page 154)
- Delete a component (on page 187)
- Delete a cable run (on page 217)
- Delete a parallel cable (on page 217)
- Delete a paralleled cable (on page 217)
- Delete a cable marker (on page 238)

Delete a cableway run

- 1. Click Select &.
- 2. In the Locate Filter, select Cableways.
- 3. Select the cableway run to delete.
- Click Delete X.

NOTE For more information on how the software performs the delete operation, see *Appendix: Deleting at Boundary Connections* (on page 296).

Delete a cableway branch

- 1. Click Select.
- 2. In the Locate Filter box, select Cableway Features.
- 3. Select the branch to delete.
- 4. Click **Delete** X.

NOTE For more information on how the software performs the delete operation, see *Appendix: Deleting at Boundary Connections* (on page 296).

Delete a cable tray with barriers

- 1. Click Select &.
- 2. Select Enclosing Runs in the Locate Filter box.
- 3. Select the cable tray run to delete.
- 4. Click **Delete** X.

The software deletes the cable tray including the barriers. If the cable tray carries cables, the **Route status** of the cables is set to **incomplete**.

Delete a cable tray barrier

- 1. Click Select &.
- 2. Select Enclosed Runs in the Locate Filter box.
- 3. Select the partition to delete.
- 4. Click **Delete** X.

The software deletes the barrier and merges the partition with the adjacent. If the partition carries a cable, the **Route status** of the cable is set to **incomplete**.

NOTE The software renders the last remaining partition into a cable tray, and the signal type of that partition is assigned to the cable tray.

Delete a straight cableway feature

- 1. Click Select &.
- 2. In the Locate Filter box, select Cableway Features.
- 3. Select the cableway feature to delete.
- 4. Click **Delete** X.

NOTE For more information on how the software perfroms the delete operation, see *Appendix: Deleting at Boundary Connections* (on page 296).

Delete a cableway turn

- 1. Click Select .
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the turn to delete.
- 4. Click Delete X.

Delete a cableway transition

- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the transition to delete.
- 4. Click **Delete** X.

Delete a conduit run

- 1. Click Select .
- 2. Select Conduit Runs in the Locate Filter box.
- 3. Select the run to delete.
- 4. Click **Delete** X.

Delete a conduit branch

- 1. Click Select .
- 2. Select Conduit Features in the Locate Filter box.
- 3. Select the branch to delete.
- 4. Click **Delete** X.

Delete a straight conduit

- 1. Click Select &.
- 2. Select Conduit Features in the Locate Filter box.
- 3. Select the straight feature to delete.
- 4. Click **Delete** X.

Delete a conduit turn

- 1. Click Select &.
- 2. Select Conduit Features in the Locate Filter box.
- 3. Select the turn to delete.
- 4. Click **Delete** X.

Delete a duct bank

- 1. Click Select &.
- 2. In the Locate Filter box, select Enclosing Runs.
- 3. Select the duct bank to delete.
- 4. Click **Delete** X.

Delete conduit from duct bank

To delete a whole conduit run

- 1. Click Select .
- 2. Select Enclosing Runs in the Locate Filter box.
- 3. Select the duct bank.

The Duct Bank Properties dialog box displays.

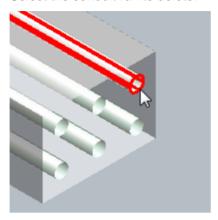
- Under the **Duct Bank** tab, select the conduit run number from the **Select Item for** Modification box.
- 5. Click Delete Conduit Run X.
- 6. Click OK.

The software deletes the selected conduit.

To delete a conduit selection

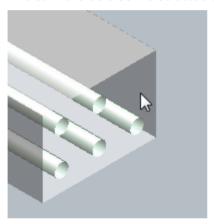
- 1. Click Select &.
- 2. Select Enclosed Runs in the Locate Filter.

3. Select the conduit run to delete.



4. Click **Delete** X.

The software deletes the selected conduit.



SECTION 9

Edit Properties

You can edit the properties of a cableway, duct bank, cable tray, conduit, and cable. Use the **Locate Filter** and **Select** to select the type of object that you want to edit.



The **Locate Filter** box contains the available, pre-defined filters for the **Select** command. When you choose a filter in the **Locate Filter** box, the software allows you to select only the filtered objects in a graphic view and in the **Workspace Explorer**. For example, if you select **Cables**, you can select only cable runs in a graphic view or in the **Workspace Explorer**.

The Electrical task includes these filters:

Cable Markers

Allows you to select markers on cable runs. You can place markers with the **Insert Cable**Marker command.

Cable Tray Nozzles

Allows you to select cable tray nozzles in the model.

Cable Tray Parts

Allows you to select cable tray parts in the model or in the **Workspace Explorer**.

CableWay/Conduit Path Features

Allows you to select all the features of a duct bank in the model.

Cables

Allows you to select cable runs in the model or in the **Workspace Explorer**.

Cableway Features

Allows you to select cableway features in the model or in the Workspace Explorer.

Cableways

Allows you to select cableways in the model or in the **Workspace Explorer**.

Conduit Features

Allows you to select conduit features in the model or in the Workspace Explorer.

Conduit Nozzles

Allows you to select conduit nozzles in the model.

Conduit Parts

Allows you to select conduit parts in the model or in the Workspace Explorer.

Conduit Runs

Allows you to select conduit runs in the model or in the Workspace Explorer.

Connections

Allows you to select connection objects when you join components together.

Control Points

Allows you to select control points in the model or in the **Workspace Explorer**.

Construction Graphics

Limits the selection of items to construction graphics.

Enclosed Runs

Selects the conduit and barrier runs in a duct bank or cable tray.

Enclosing Runs

Selects the duct bank or cable tray that encloses the conduit and barrier runs.

Equipment

Allows you to select equipment in the model or in the **Workspace Explorer**. Equipment can be placed in the Electrical task or the Equipment and Furnishings task.

Parallel Cables

Allows you to select parallel cables, which are parents of paralleled cables.

ΑII

Allows you to select any object, even objects created in another task.

More

Displays the **Select Filter** dialog box. The **Select Filter** dialog box displays all of the simple filters that are set up to accept object type or system objects as discrimination data. You can then select additional filters to add them to this list. Only the selection of filters is available; all other options are disabled.

Use the Inside Fence command to select all objects entirely inside the fence.

Use the **Overlapping Fence** command to select all objects entirely inside the fence and those objects outside but touching the fence at some point.

NOTE For detailed information about defining properties for a specific object, see *Appendix: Property Dialog Boxes* (on page 275).

Associating Features with a New Run

When you select multiple features and associate them with a new run by selecting **<New Cableway>** from the **Run** list, the **Create New Run** dialog box is populated with all of the properties belonging to the run associated with the selected features. If the existing run's

properties do not match the defaults specified in the system, a dialog box displays asking you whether you want to retrieve these properties from the **System**, the **Run**, or **None**.

■ NOTES

- If the initial set of features belongs to more than one run, the software checks if all of the selected features belong to the same system. If they do, a dialog box displays asking if you want to retrieve the properties from the **System** or **None**.
- If the features belong to different systems, the software displays the following message:
 - Selected features do not have common default run properties. Please review the run properties to ensure they meet requirements.
- If the selected features are not contiguous, the software displays the following message:
 - Features being assigned to target run are not contiguous. Do you want to proceed with this operation?
- This functionality works the same if you select an individual feature.

What do you want to do?

- Edit cableway properties (on page 160)
- Edit cableway turn feature properties (on page 160)
- Edit cableway straight feature properties (on page 160)
- Edit cableway along-leg feature properties (on page 160)
- Edit cableway end feature properties (on page 161)
- Edit cableway transition feature properties (on page 161)
- Edit cable tray part properties (on page 161)
- Modify cableway feature cross section shape (on page 47)
- Modify multiple cableway cross section sizes (on page 47)
- Edit conduit run properties (on page 161)
- Edit conduit straight feature properties (on page 162)
- Edit conduit turn feature properties (on page 162)
- Edit conduit branch feature properties (on page 162)
- Edit conduit end feature properties (on page 162)
- Edit conduit part properties (on page 163)
- Edit component properties (on page 187)
- Edit cable properties (on page 216)
- Edit parallel cable properties (on page 216)
- Edit paralleled cable properties (on page 216)
- Edit cable marker properties (on page 237)

Edit cableway properties

- 1. Click Select &.
- 2. Select Cableways in the Locate Filter box.
- 3. Select the cableway run to edit.
- 4. Click **Properties** on the ribbon.

Edit cableway turn feature properties

- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the turn feature to edit.
- 4. Click **Properties** on the ribbon.

Edit cableway straight feature properties

- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the straight feature to edit.
- 4. Click **Properties** on the ribbon.

Edit cableway along-leg feature properties

- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the along-leg feature to edit.
- 4. Click **Properties** on the ribbon.

Edit cableway end feature properties

- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the end feature to edit.
- 4. Click **Properties** on the ribbon.

Edit cableway transition feature properties

- 1. Click Select &.
- 2. Select Cableway Features in the Locate Filter box.
- 3. Select the transition to edit.
- 4. Click **Properties** on the ribbon.

Edit cable tray part properties

- 1. Click Select &
- 2. Select Cable Tray Parts in the Locate Filter box.
- 3. Select the part that you want to edit.
- 4. Click **Properties** on the ribbon.

Edit conduit run properties

- 1. Click Select &
- 2. Select Conduit Runs in the Locate Filter box.
- 3. Select the conduit run to edit.
- 4. Click **Properties** on the ribbon.
- 5. Edit the properties as needed. See *General Tab (Conduit Run Properties Dialog Box)* (on page 118) for more information about each property.

Edit conduit straight feature properties

- 1. Click Select .
- 2. Select Conduit Features in the Locate Filter box.
- 3. Select the straight feature to edit.
- 4. Click **Properties** on the ribbon.
- 5. Edit the properties as needed. See *General Tab (Conduit Straight Feature Properties Dialog Box)* (on page 121) for more information about each property.

Edit conduit turn feature properties

- 1. Click Select
- 2. Select Conduit Features in the Locate Filter box.
- 3. Select the turn feature to edit.
- 4. Click **Properties** on the ribbon.
- 5. Edit the properties as needed. See *General Tab (Conduit Turn Feature Properties Dialog Box)* (on page 123) for more information about each property.

Edit conduit branch feature properties

- 1. Click Select .
- 2. Select Conduit Features in the Locate Filter box.
- 3. Select the branch feature to edit.
- 4. Click **Properties** on the ribbon.
- 5. Edit the properties as needed. See *General Tab (Conduit Branch Feature Properties Dialog Box)* (on page 114) for more information about each property.

Edit conduit end feature properties

- 1. Click Select .
- 2. Select Conduit Features in the Locate Filter box.
- 3. Select the end feature to edit.
- 4. Click **Properties** on the ribbon.
- 5. Edit the properties as needed. See *General Tab (Conduit End Feature Properties Dialog Box)* (on page 117) for more information about each property.

Edit conduit part properties

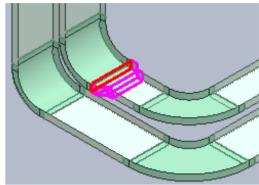
- 1. Click Select &.
- 2. Select Conduit Parts in the Locate Filter box.
- 3. Select the conduit part to edit.
- 4. Click **Properties** on the ribbon.

SECTION 10

Insert Transition

Places and modifies a transition to accommodate a cableway cross section change. You can create a transition feature only at an existing cableway end feature or cable tray nozzle.

Using Insert Transition , you can add functional capabilities to your cableway during the routing process. By placing such objects during the routing process, the software presents a more accurate model of the final cableway without extensive editing of the cableway system.



During routing, you can click this command and the software determines the settings and placement of the transition. When the transition feature is finished, the software returns to the routing process. You can also insert transitions as necessary after the route is completed.

If you insert a transition on an existing cableway route, you first must identify an end for starting the transition. The software sets the offset cross section to match the selected end.

If you insert a transition while routing cableway, the transition starts at the last routing end connection. The software uses the current routing data, such as run name and cross section, to populate the **Properties** dialog box for the transition. After you insert the transition, the **Route**Cableway command continues with the new cross section from the transition.

Insert Transition Ribbon

Allows you to create cableway transitions that accommodate changes in the shape, size, and orientation of the cableway.

Properties

Opens the **Transition Settings** dialog box. For more information, see *Transition Settings Dialog Box* (on page 176).

> Start Transition

Prompts you to select an end feature or nozzle at which to insert the cableway transition.

Offset Transition

Prompts you to establish the offset cross section for the cableway transition. If a part is associated to the transition feature, the software removes the offset box.

Part

Allows you to select the component from the catalog that you want to insert. The list includes the last 10 names of component parts that you have placed. The **More** option opens the **Select Part** dialog box for browsing the catalog for the correct part.

The Part box is not enabled if you are inserting a cableway transition (because cableway

does not have parts). However, the box is enabled if you are inserting a cable tray reducer, for example.

Finish

Ends the placement of the transition feature. Click this button after you are satisfied with the transition.

ℋ Plane

Activates options for selecting a route working plane for the transition centerline. The options include:

Plan Plane

Defines the work surface as the XY plane at the depth of the active end. You also can press CTRL+1 to select this option.

Selevation Plane: East-West (Zelane: X-Axis)

Defines the work surface as the XZ plane. You also can press CTRL+2 to select this option.

Defines the work surface as the YZ plane. You also can press CTRL+3 to select this option.

Ø Plane by Turn/Branch

Defines the work surface as the plane defined by an existing turn or branch. You select the turn or branch to set the plane. You also can press CTRL+4 to select this option.

Plane by Three Points

Defines the work surface using three points that you define. You also can press CTRL+5 to select this option.

X No Plane

Clears any work surfaces. The software does not project points that you place to any plane. You also can press CTRL+6 to select this option.

Run

States the name of the cableway associated with the transition. If you select **New Cableway**, the **New Cableway** dialog box opens. The **New/Continue Run** option automatically activates the cableway of the selected feature.

Displays existing cableway runs along with the <New Cableway>, <New/Continue Run>, and More options. Select the cableway to route or select <New Cableway> to create a new cableway to route. If a new cableway is created, all cableway runs associated with the parent system selected on the New Cableway dialog box appear in the list.

Select **<New/Continue Run>** to automatically extend an existing cableway by selecting the end feature of that cableway. If a run is continued, all runs associated with the system parent of the continued run appear in the list. If you do not select an end feature, the **New Cableway** dialog box automatically activates to create a cableway. For more information, see *New Cableway Dialog Box* (on page 61).

Select **More** to select a cableway that is associated with a different electrical system. For more information, see *Select Cableway Dialog Box* (on page 70).

Type

Designates the type of transition feature. Options include **Straight Parallel**, **Straight Slanted**, and **Turn**.

Shape

Allows you to select the shape of the cableway. You can change size and orientation, as needed. Options include **Rectangular**, **Round**, and **Flat Oval**.

Width

Defines the width of the rectangular or flat oval transition feature. Values stored in the reference data determine the list of options. Also, you can enter an amount for the width.

Depth

Defines the depth of the rectangular or flat oval transition feature. Values stored in the reference data determine the list of options. Also, you can enter an amount for the depth.

Orientation

Allows you to change the orientation of a cross section while routing, or you can edit the orientation value after routing by displaying feature property pages. The **Orientation** value can orient the cross section in a standard or skewed position and allows you to specify the location of a cross section in the cableway. Orientation changes the local axis of the cableway associated with the width axis of the offset cross section. You cannot access the command if an end feature or nozzle is selected to position the offset; this action fixes the orientation of both ends of the transition.

Align

Positions the transition on the section view of the cross section. This control is only available for straight parallel transitions.

	Align Centerline
	Align Top Left
	Align Top Right
	Align Bottom Right
	Align Bottom Left
	Align Top Center
	Align Right Center
	Align Bottom Center
	Align Left Center
2	Not Aligned

Length

Specifies the length of the transition. Type or select a length for the transition.

Diameter

Sets the diameter for a round transition. The diameter is not available if you select an end feature or nozzle to position the offset, because this action determines the cross section shape and size of the offset cross section.

Throat Radius

Allows you to set the throat radius distance for a turn transition.



3 Angle Lock

Locks or unlocks the Angle box.

Angle

Defines the angle of the turn transition. When you enter a value, the software changes the angle accordingly. Values can range from 0 to 180.

Edit Cableway Transition Feature Ribbon

Displays options for editing a cableway transition.



Displays the Cableway Transition Feature Properties dialog box. For more information, see Cableway Transition Feature Properties Dialog Box (on page 80).

Move From

Click to specify the starting location of the move vector. If you do not define a starting point, the software assumes that the current location of the object is the starting point.

Move To

Click to specify the ending location of the move vector.

End

Allows you to select the beginning, end, or both faces of the transition. If you select both faces, only limited options for editing the properties are available.

Part

Allows you to specify the part associated with the transition feature.

The **Part** box is enabled only if you are editing a cable tray (cableway does not have parts).

Plane

Activates options for selecting a working plane for the route path. Six options are available:

Plan Plane

Defines the work surface as the XY plane at the depth of the active end. You also can press CTRL+1 to select this option.

🛂 Elevation Plane: East-West (🏳 Z Plane: X-Axis)

Defines the work surface as the XZ plane. You also can press CTRL+2 to select this option.

■ 🐫 Elevation Plane: North-South (🐫 Z Plane: Y-Axis)

Defines the work surface as the YZ plane. You also can press CTRL+3 to select this option.

Plane by Turn/Branch

Defines the work surface as the plane defined by an existing turn or branch. You select the turn or branch to set the plane. You also can press CTRL+4 to select this option.

Plane by Three Points

Defines the work surface using three points that you define. You also can press CTRL+5 to select this option.

X No Plane

Clears any work surfaces. The software does not project points that you place to any plane. You also can press CTRL+6 to select this option.

Type

Designates the type of transition feature. Options include **Straight Parallel**, **Straight Slanted**, and **Turn**. This box is enabled only for cableway, not for cable tray.

Shape

Sets the shape of the cross section. When you change the type, the dimension boxes change accordingly. This box is enabled only for cableway, not for cable tray.

- If you select Rectangle or Flat Oval, the Width and Depth boxes are available.
- If you select Round, the Diameter box is available.

This box displays the current value if an end feature is selected to position the offset because this fixes the cross section shape and the size of the offset cross section.

Width

Sets the width dimension of the cross section. This option is available only if you have selected **Rectangle** or **Flat Oval** in the **Shape** box. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current depth. If the depth is not defined, or the **Depth** box is empty, the width size is based on the default width ratio.

Depth

Sets the depth of the cross section. This option is available only if you have selected **Rectangle** or **Flat Oval** in the **Shape** box. The list of options is determined by the values stored in the reference data. The list displays only the values that are valid for the current width. If the width is not defined, or the **Width** box is empty, the depth size is based on the default width ratio.

Diameter

Sets the diameter of the round cross section.

Orientation

Determines the orientation of the cross section.

Align

Sets the alignment for the transition. Each alignment entry has a point that represents the alignment point on the section view of the cross section.

	Align Centerline
	Align Top Left
	Align Top Right
	Align Bottom Right
	Align Bottom Left
	Align Top Center
	Align Right Center
	Align Bottom Center
	Align Left Center
2	Not Aligned

Length

Enter or select a length for the transition.

Edit Cableway Turn Transition Feature Ribbon

Displays options for editing a cableway turn transition.



Displays the **Cableway Turn Transition Feature Properties** dialog box. For more information, see *Cableway Turn Transition Feature Properties Dialog Box* (on page 85).

Move From

Click to specify the starting location of the move vector. If you do not define a starting point, the software assumes that the current location of the object is the starting point.

Move To

Click to specify the ending location of the move vector.

Plane

Activates options for selecting a working plane for the route path. Two options are available: Width Plane and Depth Plane.

Type

Designates the type of transition feature.

3 Angle Lock

Locks or unlocks the Angle box. Locking the corresponding angle value creates a constraint along which the selected turn angle can be moved.

Angle 2

Specifies the angle of the turn feature located at the end of one associated leg. If this box is blank, there is no turn feature located at the end of the leg. Although this value can be changed, the location of the corresponding turn cannot. Modification of this value repositions the selected turn until the specified angle is achieved.

Angle 1

Specifies the angle of the turn that you are editing. Modification of this value repositions the selected turn until the specified angle is achieved.

Angle 3

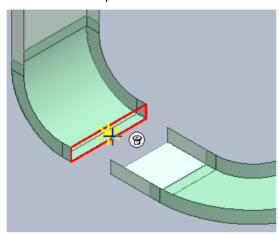
Specifies the angle of the turn feature located at the end of one associated leg. If this box is blank, there is no turn feature located at the end of the leg. Although this value can be changed, the location of the corresponding turn cannot. Modification of this value repositions the selected turn until the specified angle is achieved.

What do you want to do?

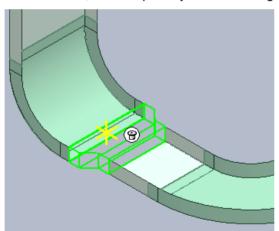
- Create a transition (on page 171)
- Create a transition while routing (on page 173)
- Set alignment options

Create a transition

- 1. Click Insert Transition 1.
- 2. Set the transition start point by selecting an end feature or a nozzle.
 - TIP If you select an end before clicking **Insert Transition**, the software inserts the transition at that point.

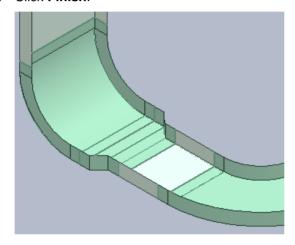


3. On the ribbon, select a part if you are working with cable tray.



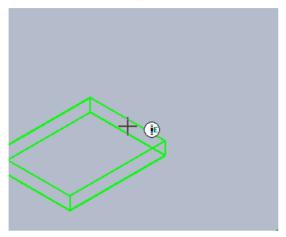
- 4. Click to place the position of the offset cross section.
- 5. If needed, click the other controls on the ribbon to set the plane, type, shape, and dimensions of the transition.
- 6. Click Align on the Insert Transition ribbon.
- 7. Select an option, represented by an icon, from the list to define the alignment for your transition. The **Align** control is only available for straight parallel transitions.
 - Align Centerline
 - - Align Top Left
 - Align Top Right

- Align Bottom Right
- ☐ Align Bottom Left
- Align Top Center
- Align Right Center
- □ Align Bottom Center
- Align Left Center
- Not Aligned
- 8. Click Finish.

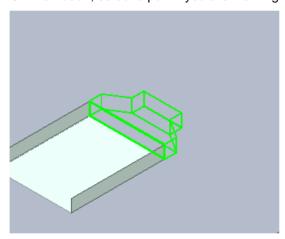


Create a transition while routing

1. Click **Route Cableway 7**, and create or extend a cableway run or network.

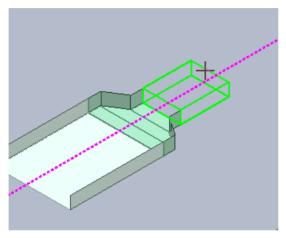


- 2. Click Insert Transition 1.
- 3. On the ribbon, select a part if you are working with cable tray.



- 4. Click to place the position of the offset cross section.
- 5. Click Align on the Insert Transition ribbon.
- 6. Select an option, represented by an icon, from the list to define the alignment for your transition. The **Align** control is only available for straight parallel transitions.
 - Align Centerline
 - Align Top Left
 - Align Top Right
 - Align Bottom Right
 - ☐ Align Bottom Left
 - Align Top Center

- Align Right Center
- Align Bottom Center
- Align Left Center
- Not Aligned
- 7. If needed, click the other controls on the ribbon to set the plane, type, shape, and dimensions of the transition.
- 8. Click Finish.



9. Continue routing the cableway as needed.

Select Part Dialog Box

Allows selection of the part to be placed. This dialog box appears when you are inserting a transition or component. By browsing through the part hierarchy, you can find the applicable part in the parts catalog. After you select a part, the software returns you to the model, where you can finalize placement.

Back

Returns you to the previously selected location. Use this command to navigate through the hierarchy to the specific part you need.

⇒ Forward

Sends you to the last selected location that you moved away from by using the **Back** button. Use this command to navigate through the hierarchy to the specific part you need.

1 Up One Level

Brings up the next highest level of the catalog hierarchy. Use this command to navigate through the hierarchy to the specific part you need.

Copy

Copies the selected object. This command is available only in the Catalog task.

Paste

Pastes a copied object. This command is available only in the Catalog task.

X Delete

Deletes the selected object. This command is available only in the Catalog task.

Undo

Reverses the most recent operation. This command is available only in the Catalog task.

New Object

Creates a new object. This command is available only in the Catalog task.

1 Move Up

Moves up one object. The level in the hierarchy remains the same.

Move Down

Moves down one object. The level in the hierarchy remains the same.

Properties

Displays the properties of the selected part. Because you cannot modify any properties until the part is placed, all properties on the dialog box are read-only.

Preview

Displays a picture of the selected part. The image file must be assigned to the part in the reference data.

Filter

Filters data in the grid view by the existing data in the grid. You must have the **Grid View** active to filter. You cannot filter the **List View**.

≜ ↓ Sort

Activates the **Sort** dialog box, which you can use to sort data on multiple columns. The software saves the sort information in the catalog database, not your session file. For more information, refer Catalog help.

X Customize Current View

Activates the **Customize Current View** dialog box, which you can use to show and hide property columns and control the property column display order (the order from left to right). For more information, refer Catalog help.

List View

Sets the dialog box to display the parts in a list view.

Grid View

Sets the dialog box to display the parts in a spreadsheet-style grid view.

Check Data

Checks the consistency of the data in the grid against other data in the catalog. This command is available only in the Catalog task.

Address

Specifies your exact location within the displayed hierarchy.

Transition Settings Dialog Box

Sets options for a transition feature that you are inserting.

Topics

General Tab (Trans	ition Settings Dialog Box)	176	ì
Cross Section Tab (Transition Settings Dialog Box)	177	7

General Tab (Transition Settings Dialog Box)

Displays and defines the general properties of the transition that you are inserting.

Standard

Cableway

Displays or defines the name of the cableway transition feature. You can also let the software use a default name.

Specification

Displays or defines the cableway specification from a list of allowed specifications for the associated system. Specifications are assigned to systems in the Systems and Specifications task.

Transition Type

Displays the type of the transition, such as parallel.

Part

Displays or defines a part associated with the transition, if applicable.

Length

Displays or defines the length of the transition along the cableway. This box appears for straight slanted transitions only.

Fill Information

Percent Fill

Displays or defines the percent cable fill in the cableway feature.

Cross Section Tab (Transition Settings Dialog Box)

Displays and defines the cross section properties of the transition that you are inserting.

Standard

Position

Displays or defines the start or end face of the transition.

Cross Section

Defines the shape of the cross section. You can select from rectangular, round, and flat oval. If the cross section is round, only one other property is available: **Diameter**.

Width

Sets the width dimension for rectangular and flat oval cross sections. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current depth. If the depth is not defined (that is, the **Depth** box is blank), all widths listed in the current specification are shown.

Depth

Sets the depth of the cross section for rectangular and flat oval cross sections. Values stored in the reference data determine the list of options. The list displays only the values that are valid for the current width. If the width is not defined (that is, the **Width** box is blank), all depths listed in the current specification are shown.

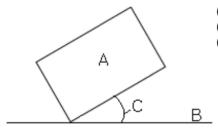
Diameter

Determines the diameter for round cross sections. Values stored in the reference data determine the list of options. You can also enter a value that is not on the list.

Orientation Angle

Sets an angle between the local axis associated with the cross section and the width axis. If the angle value is zero, the width is aligned with the local cross section axis.

The following picture shows the orientation angle (C).



- (A) Cross section
- (B) Width axis
- (C) Orientation angle

Fill Information

Percent Fill

Displays or defines the percent cable fill in the cableway feature.

SECTION 11

Insert Component

Places components such as branches, ends, reducers, and turns for cableway and couplings, unions, and tees for conduit. You must select a straight feature, end feature, nozzle, or component port in the model when using this command. You can add components either during the routing process or after the cableway or conduit has been routed.

The software uses the specification and the insertion point to filter the components available for placement. The software also generates any mating and connection parts required to connect the inserted part to adjacent objects.

When inserting components, you can use the **Tools > PinPoint** and **Tools > Point Along** commands to position components precisely.

Cableway> from the Run list, the software populates the Create New Cableway dialog box with the properties belonging to the existing run (that is, the run you selected in which to insert the component). If the properties of the existing run do not match the defaults specified in the electrical system, the software displays a dialog box asking you if you want to use the properties of the System, Run, or None.

Insert Component Ribbon (Cableway)

Allows you to insert components in a cableway route along a straight feature, end feature, nozzle, or component port. You can insert components after routing or while routing.



Opens the **Insert Component Settings** dialog box. For more information, see *Insert Component Settings Dialog Box* (on page 187).

🕅 Select Straight or End Feature

Prompts you to select a straight feature, end feature, nozzle, or a component port.

Part

Allows you to select a part from the catalog.

Enter Insertion Point

Positions the component that you are placing. You can use the **Tools > PinPoint** and **Tools > Point Along** commands to define the precise location of the component.

Finish

Ends the placement of the component feature. Click this button after you are satisfied with the editing that you have completed and the positioning of the component.

Run

Displays the name of the run in which the component is placed.

■ NOTE If you specify that the component should be created as a new run by selecting <New Cableway> from the Run list, the software populates the Create New Cableway

dialog box with the properties belonging to the existing run (that is, the run you selected in which to insert the component). If the properties of the existing run do not match the defaults specified in the electrical system, the software displays a dialog box asking you if you want to use the properties of the **System**, **Run**, or **None**.

Name

Displays the name of the component that you are inserting. This control becomes available when you choose a part.

The following controls become available after you click to position the component.

₩ Flip

Select this option to change the component port that is connected to the selected port.

Reference position

Slides the component that you are inserting so that its origin or selected port is positioned at the insertion point. If the selected reference position does not lie along the axis of the leg, then the software projects the position so that it intersects the axis and the component slides so that the projected point is located at the insertion point.

Insert Component Ribbon (Conduit)

Allows you to insert components in a conduit route along a straight feature, end feature, nozzle, or component port. You can insert components after routing or while routing.



Opens the **Conduit Component Properties** dialog box. For more information, see *Conduit Component Properties Dialog Box* (on page 115).

🕅 Select Straight or End Feature

Prompts you to select a straight feature, end feature, nozzle, or a component port to begin the steps to insert the conduit component.

Type

Displays a list of available components. Select the type of component that you want to insert.

Option

Sets the available options of the component type. The list of options depends on the contents of the reference data for the component.

K Enter Insertion Point

Positions the component that you are placing. You can use the **Tools > PinPoint** and **Tools > Point Along** commands to define the precise location of the component.

Finish

Ends the placement of the component feature. Click this button after you are satisfied with the editing that you have completed and the positioning of the component.

Run

Displays the name of the run in which the component is placed.

NOTE If you specify that the component should be created as a new run by selecting

<New Cableway> from the Run list, the software populates the Create New Cableway dialog box with the properties belonging to the existing run (that is, the run you selected in which to insert the component). If the properties of the existing run do not match the defaults specified in the electrical system, the software displays a dialog box asking you if you want to use the properties of the System, Run, or None.

Name

Displays the name of the component that you are inserting. This option is only available after you choose the type of part.

The following controls become available after you click to position the component.

₩ Flip

Select this option to change the component port that is connected to the selected port.

Reference position

Slides the component that you are inserting so that its origin or selected port is positioned at the insertion point. If the selected reference position does not lie along the axis of the leg, then the software projects the position so that it intersects the axis and the component slides so that the projected point is located at the insertion point.

🕱 Rotate

Rotates the component about the conduit. Select to rotate the component about the conduit interactively.

Angle

Type an angle at which you want the component rotated about the conduit.

Edit Cableway Along Leg Feature Ribbon

Displays options for editing a cableway along leg feature.

Properties

Displays the **Cableway Along Leg Feature Properties** dialog box. For more information, see *Cableway Along Leg Feature Properties Dialog Box* (on page 71).

Move From

Click to specify the starting location of the move vector. If you do not define a starting point, the software assumes that the current location of the object is the starting point.

Move To

Click to specify the ending location of the move vector.

Run

Specifies the name of the cableway run. You can select a different run from the recently used runs that are listed or select **More** to select a different cableway in the workspace or database.

Part

Displays the part description.

Direction

This option is not available for this release.

Angle 1

Specifies the branch angle of the along leg feature. We recommend that you do not edit this angle if the along leg feature ends with a free leg.

Angle 2

Specifies the branch angle of the feature located at the other end of the branch. This box is blank if the branch is a free leg.

Edit Conduit Component Ribbon

Displays options for editing a conduit component.



Opens the **Conduit Component Properties** dialog box. For more information, see *Conduit Component Properties Dialog Box* (on page 115).

Move From

Click to identify the origin of the move vector. If you do not define a starting point, the software assumes the current location of the component is the starting point.

Move To

Click to identify the termination point of the move vector.

Type

Displays the short code associated with the selected component.

Option

Displays the option of the selected component, if applicable.

Name

Displays the name of the selected component.

MM Flip

Select this option to change the component port that is connected to the selected port.

Rotate

Select to rotate the component about the conduit interactively.

Angle

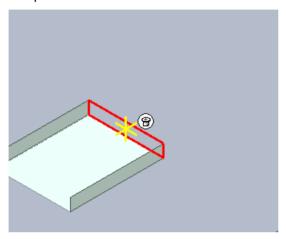
Type an angle at which you want the component rotated about the conduit.

What do you want to do?

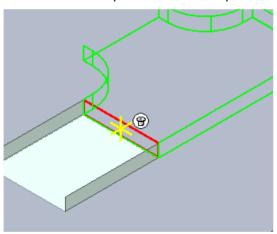
- Insert a cable tray component (on page 182)
- Insert a conduit component (on page 183)
- Insert a component while routing (on page 184)
- Rotate a conduit component (on page 185)

Insert a cable tray component

- 1. Click Insert Component .
- 2. Select a straight feature, end feature, nozzle, or component port as the insertion point of the component.

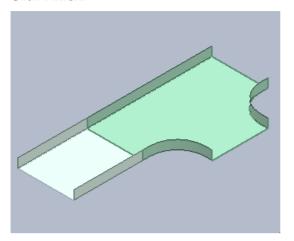


- 3. In the Part box, select a part from the list or click More for additional parts from the catalog.
- 4. Click to define the position of the component if you are placing it in a straight feature.



5. If needed, change the properties of the component by using the options on the ribbon.

6. Click Finish.



Insert a conduit component

- 1. Click Insert Component .
- 2. Select a straight feature, end feature, nozzle, or component port as the starting point of the component.



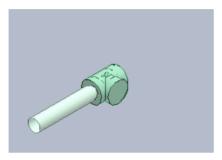
- 3. Select the component type in the **Type** box on the ribbon.
- 4. Click to define the position of the component if you are placing it in a straight feature.



5. If needed, change the properties of the component using the options on the ribbon.



6. Click Finish.



Insert a component while routing

- 1. Click Insert Component **1**.
- 2. Select a straight feature, end feature, nozzle, or component port as the insertion point of the component.
- 3. Do one of the following:
 - a. For a cable tray component, select a part in the Part box.
 - b. For a conduit component, select the type in the **Type** box.
- 4. Click to define the position of the component if you are placing it in a straight feature.
- 5. If needed, change the properties of the component by using the options on the ribbon.
- 6. Click Finish.
- 7. Continue routing the cableway or conduit run.

Rotate a conduit component

- 1. Click Select .
- 2. Select Conduit Features in the Locate Filter box.
- 3. Select the component.



- 4. Click **Rotate** $\overline{\mathbb{A}}$ on the ribbon, and then move the mouse to rotate the component.
- 5. Click to release the component at the new rotation angle.
 - TIP You can also type a rotation angle in the Angle box.



6. As necessary, edit other properties using the options on the ribbon.

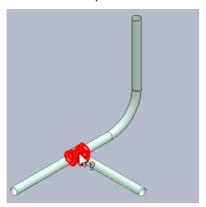
Move a cableway component

- 1. Click Select .
- 2. Select Cableway Features in the Locate Filter.
- 3. Select the component. If you do not select a move from location, the current location of the object is used as the from location.
- 4. Click **Move To** \nearrow on the ribbon.
- 5. Move the component to the new location.
 - TIP You can use the **Tools > Point Along** and **Tools > PinPoint** commands to locate the component precisely.

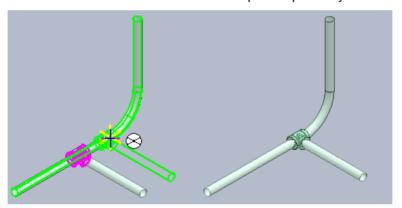
Move a conduit component

1. Click Select .

- 2. Select Conduit Features in the Locate Filter.
- 3. Select the component such as a tee, pull box, or coupling.



- 4. Click **Move To** \nearrow on the ribbon.
 - TIP If you do not select a move from location, the current location of the object is used as the from location.
- 5. Move the component to the new location. You can use the **Tools > Point Along** and **Tools > PinPoint** commands to locate the component precisely.



Edit component properties

- 1. Click Select &.
- 2. Do one of the following:
 - Select Cableway Features in the Locate Filter box to edit a cable tray component.
 - Select Conduit Features in the Locate Filter box to edit a conduit component.
- 3. Select the component.
- 4. Click **Properties** to edit component properties.
- 5. Edit the component properties.

Delete a component

- 1. Click Select &.
- 2. Do one of the following:
 - Select Cableway Features in the Locate Filter box to delete a cable tray component.
 - Select Conduit Features in the Locate Filter box to delete a conduit component.
- 3. Select the component.
- 4. Click **Delete** X.

Insert Component Settings Dialog Box

Sets options for a cable tray component that you are inserting in the model.

General Tab (Insert Component Settings Dialog Box) (on page 187)

General Tab (Insert Component Settings Dialog Box)

Displays and defines the general properties of the cable tray component.

Standard

Cableway

Displays the name of the cableway run.

Specification

Displays the cableway specification.

Angle

Type an angle at which you want the component rotated. Any previous settings are automatically updated.

Part

Displays the part description of the component.

The additional properties listed in the **Standard** category depend on the exact component that you are placing.

Maintenance Volume

A maintenance volume is space reserved for installing and maintaining cables in a cable tray and can be defined at the cableway level and optionally overridden at the feature level. You can also define maintenance volumes for duct banks to reserve space for a mud mat below the duct bank. Use the **Format > View** command to turn on the **Maintenance** aspect so you can see the maintenance volumes in the model.

Maintenance Volume Properties Option

Select **Use Run Properties** to use the maintenance volume properties defined for the parent run. Select **Default Feature Properties** to define maintenance volume settings that are unique for this feature. This option is only available when editing the properties of a feature.

Maintenance Shape

Specifies the maintenance volume shape: Rectangle, Round, or Flat Oval.

Maintenance Diameter

Specifies the diameter of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Round**.

Maintenance Width

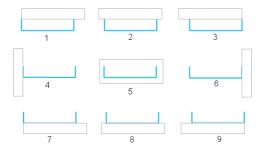
Specifies the width of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Depth

Specifies the depth of the maintenance volume. This option is only available when **Maintenance Shape** is set to **Rectangle** or **Flat Oval**.

Maintenance Justification

Specifies how the maintenance volume (gray box below) aligns with the feature (blue cross section below). There are ten options available: (1) **Top Left**, (2) **Top Center**, (3) **Top Right**, (4) **Center Left**, (5) **Center Center**, (6) **Center Right**, (7) **Bottom Left**, (8) **Bottom Center**, (9) **Bottom Right**, and **User Defined**.



Maintenance Width Offset

Specifies the width offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Maintenance Depth Offset

Specifies the depth offset distance. This option is only available when **Maintenance Justification** is set to **User Defined**.

Fill Information

Fill Efficiency

Specifies the efficiency of the stacking of cables in the cableway. Type a real number, integer, or percent. For example, type 0.9, 90, or 90%.

Signal Type

Specifies the cable usage, which Smart 3D uses in tray fill calculations. To change the options on the list, edit the **Signal Type** select list in Catalog.

Voltage Grade

Specifies the voltage grade, which Smart 3D uses when determining the range of voltage that the cableway can carry. To change the options on the list, edit the **Voltage Grade** select list in Catalog.

SECTION 12

Auto Connect Cableways

You can automatically connect cableways. This command automatically places the fittings needed to connect the cableway. Zero spec cableway (Cws-0) is routed between existing cableways and a new cableway is automatically placed.

Auto Connect Cableways Ribbon

Sets options for automatically routing a cableway.

Locate Filter

Sets the feature: Cableways, Cableway Features, or Conduit End Features. By default, Cableways is selected.

Select from Cableways

Select the cableway runs, cableway, or conduit end feature to connect "From." These cableway centerlines display in green.

Select to Cableways

Select the cableway runs, cableway, or conduit end feature to connect "To." These cableway centerlines display in blue. Centerlines of the Auto Connect Cableways that will be created are displayed in yellow.

Finish

Click to create the cableways.

X Reject Selection

Clears the currently selected features.

Accept Selection

Accepts the currently selected features.

Specification

Defines a cableway specification.

Distance

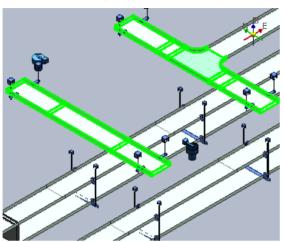
Defines an upper limit on the length of connecting cableways. **Unlimited** is an available option on the drop-down field.

What do you want to do?

- Route cableways automatically (on page 191)
- Merge two duct bank segments (on page 192)

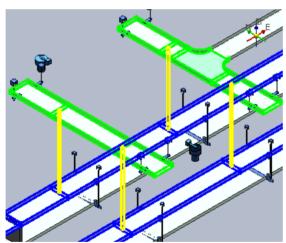
Route cableways automatically

- 2. Select a cableway for the vertical drop-outs to begin. You can select multiple cableways.

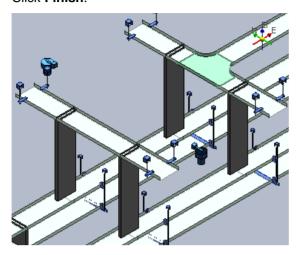


3. Select a cableway for the vertical drop-outs to end.

Placement of the new cableway is automatically calculated. The default placed cableway value is CWS- 0.



4. Click Finish.



Merge two duct bank segments

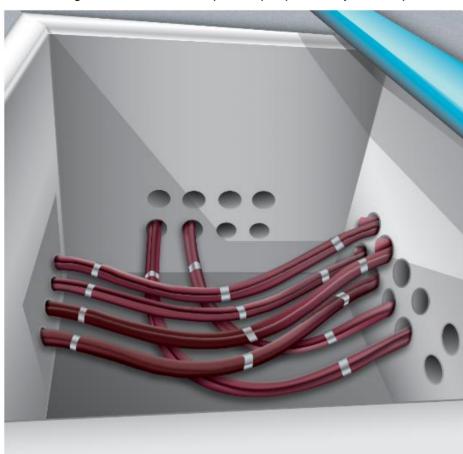
The preferred approach to joining two or more discontinuous duct banks is to route from one of the segments along the path.

Alternatively, you can manually reposition the conduits within the duct bank so that the two cross-sections match. Then the two segments can be merged. After ensuring that the cross-sections match up, each conduit run in one duct bank needs to be extended to join its corresponding conduit run in the other duct bank. To achieve this join operation, use the Route command or the **Move** command.

NOTE Without this manual joining, path continuity is not achieved and cables cannot be routed between the two conduit runs.

Duct Banks at Pull Pits

To enable cable routing between the conduits, use pull pits to join conduits between duct banks. Begin by placing the pull pit, found in Equipment, and then routing the duct banks up to the pull pit. Within the pull pit, connect conduit end features belonging to different duct banks with zero spec cableway (CWS-0). The zero spec cableway ensures continuity for cables to pass through. In addition, using the **Auto Connect** command to create these connecting cableways simplifies the process.



The following illustration is an example of a pull pit; this is just one option.

See Also

Auto Connect Cableways (on page 190)
Place Equipment from the Catalog (on page 197)
Route Duct Bank (on page 126)

SECTION 13

Place Equipment

Specifies any piece of equipment from the Equipment folder of the catalog and places an occurrence of it inside the model. You can modify the offset of the equipment, its relationships to other equipment, and other properties during or after placement. Using positioning relationships, the **Place Equipment** command allows you to mate, connect, or align equipment, and you can use common tools like the **PinPoint** command for precise positioning of the equipment.

If a parent object is selected when you start **Place Equipment**, the **System** property is automatically updated with the parent object.

You place equipment objects into the model by selecting the equipment from the **Select Equipment** dialog box and positioning the equipment in the model using the available relationships. When you select an equipment object from the Catalog, you can define a default surface so that, when the equipment is placed into the model, the software automatically creates a relationship to any other surface or reference element that you select. For example, you might define the bottom of a pump as the default surface because you want the software to mate that surface to the floor. If the software cannot find a suitable mating surface for the equipment, the equipment object is placed in free space, pending additional design of the structures or other reference elements.

You can also provide an optional offset distance from the surface or reference elements. The default offset distance for any new piece of equipment is zero or the last offset used in the current session. The software maintains the offset relationship between the default surface and the surface or reference element in the workspace in the event of any changes to their position (for example, if a slab is lowered, then the equipment follows the slab, maintaining the offset). You can further define the equipment position and orientation by mating, aligning, or connecting equipment to other objects in the model, or by moving or rotating the equipment.

In addition to placing equipment from the **Select Equipment** dialog box, you can also drag and drop equipment directly from the **Catalog Browser** in another session opened on the same computer. In this case, the software places the equipment in free space, with relationship to other elements in the model made by locating objects while dragging the equipment in the new session.

Cable and Equipment

If you are going to use an object for routing cable, you must not model that object as equipment.

Although it may sometimes be desirable to model a piece of raceway, cable tray, or cable bus as a piece of equipment, you should not do this if there is any possibility of ever needing to route cable through the object. This is because cable routes cannot traverse equipment; they can only be terminated by equipment. A cable cannot be properly routed through a piece of equipment. The cable can only interconnect two pieces of equipment.

An example is a pull box. This object should be created in the catalog data as a conduit fitting, not as a piece of equipment. Otherwise, the object will render conduit networks useless for cable routing every time it is used.

Equipment with Occurrence Properties Modeled Using Solid Edge

You cannot place equipment with occurrence properties modeled using Solid Edge unless Solid Edge is installed on your computer. If you try to place such an object, the following message appears: Cannot start Solid Edge. Exiting InitializSymbolDefinition.

As a workaround to the Solid Edge requirement, you can use the Bulkload utility with the flavors option. Designers can create dozens of variations for any equipment part imaginable. Also, by creating several variations of a part, rather than using occurrence properties to create the variations automatically, designers can implement custom Solid Edge equipment without having to install Solid Edge on every designer's computer.

Each variation of a part represents some minor deviation from the catalog part, be it on the basis of size, operational specifications, or material. With Solid Edge, new variations can be created on the basis of size, while the software allows manipulation of the operating parameters or material of construction in the reference data. For more information on bulkloading with flavors, refer to the *Reference Data Guide*, accessible from the **Help > Printable Guides** command in the software.

Place Equipment Ribbon

Sets options for adding equipment to your model. This ribbon appears automatically after you select the **Place Equipment** command and then select an equipment object, or when you select an existing piece of equipment.

TIP To find out the name of an option on the ribbon, pause the pointer over an option and read the ToolTip.

Equipment Properties

Edits the occurrence properties and reviews the static properties of an existing piece of equipment. Equipment properties can be set only after an equipment object is placed in the model. Equipment properties can be edited only after the object is placed in the model.

NOTE Any object modeled in Solid Edge that has occurrence properties cannot be placed or modified unless your computer has a copy of Solid Edge installed.

User Defined Form Definition

Displays **User Defined Form** for the particular equipment if it is defined in the catalog. See the *Equipment and Furnishings Reference Data Guide*, available from the **Help > Printable Guides** command in the software.

Relationship List

Lists all relationships for the selected equipment and provides an option for creating a new relationship if the equipment is not already fully constrained. An equipment part is fully constrained when it has sufficient defined relationships to prevent movement or rotation of the part along all three coordinate axes.

Positioning Relationships

Displays the available options for types of positioning relationships. Some options may not be available for all equipment types. See Positioning Relationships for more information.

M Delete Relationship

Removes the selected relationship from the equipment model and the database. Using the **Relationships** list box, select a previously existing relationship for the equipment, and click

Delete Relationship. You can use this command only when modifying existing equipment.

Pa Equipment Reference

Prompts you for the reference on the equipment to be placed that will be affected by the positioning relationship. In all cases, the part that you select in this step moves to create the relationship, and the part chosen in the **Second Part Reference** step remains fixed.

Second Part Reference

Prompts you for the reference on the equipment object or reference element already in the model that will be affected by the positioning relationship. After you select the reference, the software repositions the first equipment part chosen with respect to the second part selected in the definition of the relationship.

Offset

Defines the offset distance for a mate or align relationship. Offsets are disabled when establishing a connect relationship. You can adjust this value after initial equipment placement if needed.

Name

Displays the equipment name, as dictated by your predefined name rules, and accepts changes to that name.

System

Specifies the system with which to associate the selected equipment. The default system is the Model itself.

<Select Graphically>

Allows you to select the system from the graphic view or from the **Workspace Explorer**. You can then place or modify the equipment.

Select Equipment Dialog Box

Specifies the equipment needed for placement. This dialog box appears automatically when you click the **Place Equipment** command. By browsing through the part hierarchy, you can find any piece of equipment in the Catalog database. After you select a piece of equipment and click **OK**, the **Equipment Properties** dialog box appears so you can define properties for the new equipment. After you click **OK** on the **Properties** dialog box, the software returns you to the model so that you can finalize configuration and placement.

Back

Returns you to the previously selected equipment part or node. Use this command to navigate through the equipment hierarchy to the specific part you need.

Forward

Sends you to the last selected equipment part or node that you moved away from by using the **Back** button. Use this command to navigate through the equipment hierarchy to the specific part you need.

🖺 Up One Level

Brings up the next highest level of the Equipment catalog hierarchy. Use this command to navigate through the equipment hierarchy to the specific part you need.

Properties

Displays the equipment properties as defined in the catalog.

Preview

Displays a bitmap symbol of the selected equipment. The image file must be assigned to the equipment in the catalog reference data.

List View

Sets the dialog box to display equipment in a list view.

Grid View

Sets the dialog box to display equipment in a spreadsheet-style grid view.

Address

Specifies your exact location within the displayed hierarchy.

What do you want to do?

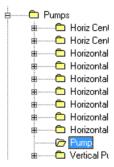
- Place equipment from the catalog (on page 197)
- Set positioning relationships for equipment (on page 198)
- Edit equipment properties (on page 199)
- Edit equipment relationships (on page 199)

Place equipment from the catalog

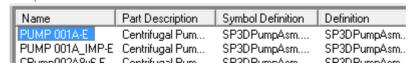
1. Click Place Equipment � on the vertical toolbar.

The Select Equipment dialog box displays.

2. Locate the necessary equipment type using the tree view. Expand the nodes for the general type of equipment that you need, continuing until a list of available parts appears in the catalog window.



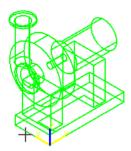
3. In the list view, select the equipment object.



4. Click **OK** on the **Select Equipment** dialog box.

The **Equipment Properties** dialog box displays so that you can define properties for the new object.

- 5. Define properties as needed, and then click **OK** to return to the workspace and place the equipment. For more information, see *Equipment Properties Dialog Box* (on page 200).
- 6. Click in a graphic view to select the mounting surface and approximate position for the object.



TIP Press the left and right arrow keys to rotate the equipment by 90-degree increments at any time during the placement of the equipment. Press the up arrow key to scroll through the three possible axes of rotation. Press the down arrow key to scroll to each datum point.

- 7. Using the **Place Equipment** ribbon, do any of the following, if needed:
 - a. Set an offset for the relationship by specifying the distance in the **Offset** box.
 - b. Click **Properties** on the ribbon, and type any necessary property information in the grid provided on the **Equipment Properties** dialog box.
 - Add or change a positioning relationship by selecting it from the Relationship list on the Place Equipment ribbon.
 - d. Select a system with which to associate the new object in the **System** box.

■ NOTES If you intend to use an object for routing cable, you must not model that object as equipment. For example, a pull box should be created in the catalog data as a conduit fitting, not a piece of equipment. Otherwise, the object will render conduit networks useless for cable routing every time it is used.

Set positioning relationships for equipment

- 1. Select the equipment for which you need to define a relationship.
- 2. In the Relationship List box on the Place Equipment ribbon, select <New Relationship>.
- 3. Select one of the available positioning relationships in the **Positioning Relationships** list box, and follow the status bar prompts.

■ NOTE Depending on the type of positioning relationship defined in the previous step, surfaces or points need to be defined to finish configuring the relationship. For more information, see Positioning Relationships.

Edit equipment properties

- 1. Select the equipment object that you need to modify.
- 2. Click **Equipment Properties** on the horizontal ribbon.

The **Equipment Properties** dialog box displays.

- TIP You can also access the **Equipment Properties** dialog box by selecting **Properties** from the **Edit** menu, or by right-clicking the selected object and choosing **Properties** from the short-cut menu.
- 3. Choose the appropriate dialog box tabs, and modify the properties as needed.
- 4. Click **OK** to save your changes, and return to the workspace.
 - TIP You can also select **Apply** to put the changes into effect and continue working in the **Equipment Properties** dialog box.

■ NOTES

All occurrence and definition properties for an equipment object are defined by the Microsoft Excel® workbook named **Equipment.xls** in the reference data. For information on adding or editing different types of properties, refer to the *Reference Data Guide*, accessible from the **Help** > **Printable Guides** command.

- If more than one piece of equipment is selected, the Occurrence tab displays only the common occurrence properties of the objects.
- The Definition, Connections, Weight & CG, and Relationship tabs are read-only. You cannot edit this information from the Equipment Properties dialog box.
- If the equipment model was created using Solid Edge, then any changes that affect the shape or size of the equipment model require that you have Solid Edge running on your computer.

Edit equipment relationships

- 1. Select the equipment to modify.
 - TIP To edit the properties of a designed equipment object for which geometry has yet to be defined, you must select the object from the system hierarchy in the **Workspace**Explorer.
- 2. Specify the relationship in the **Relationship List** box.
- 3. Change the type of relationship using the **Positioning Relationship** box as needed.

Set positioning relationships for equipment (on page 198) Set positioning relationships for designed equipment

▶ NOTE You can remove relationships by clicking **Delete Relationship** ♦ on the ribbon. This step is often necessary when moving previously constrained equipment. After a relationship is deleted, no connectivity remains between the two pieces of equipment during further design operations.

Equipment Properties Dialog Box

Displays equipment properties for review and editing.

See Also

Occurrence Tab (Equipment Properties Dialog Box) (on page 200)
Definition Tab (Equipment Properties Dialog Box) (on page 208)
Connection Tab (on page 209)
Relationship Tab (on page 278)
Configuration Tab (on page 275)
Notes Tab (on page 277)
Edit Equipment Properties (on page 199)
Edit Equipment Relationships (on page 199)

Occurrence Tab (Equipment Properties Dialog Box)

Displays all the editable instance-specific information about the selected equipment object. The property name appears on the left side of the grid and the corresponding property value appears on the right side of the grid. If more than one equipment object is selected, only the common occurrence properties for the selected objects appear on the tab.

When viewing properties for a single equipment object, the following properties appear. More properties may appear depending on what you defined in the reference data. For more information about occurrences defined in the reference data, see the *Equipment and Furnishings Reference Data Guide* available with the **Help > Printable Guides** command in the software.

NOTE Because equipment properties are customizable in the equipment and furnishings reference data, only the properties that are required by the software are documented.

Show Dimensional Legend

Displays the bitmap image associated with the equipment object if it has been defined in the reference data. The image displays in a separate window.

Category

Select the properties to view, modify, or define. Equipment properties are divided into several different categories: Standard, Position and Orientation, Insulation and Tracing, Weight and CG, Equipment Dimension, Fabrication and Construction, Surface Treatment and Coating, and Responsibility.

Standard

Name

Displays the name of the equipment object. The equipment name is based on the **Name Rule** selection. If you type a name in this field, the **Name Rule** property updates to **User Defined**.

Name Rule

Specify the naming rule to use to name this equipment object. You can select one of the listed rules or select **User Defined** to specify the equipment name yourself in the **Name** box.

Description

Specifies a description for the object.

Equipment

Select the system to which the object belongs. By default, the model is the parent system for the object. If a parent system is selected when you start the command, **System** is automatically updated with the selected system. If multiple systems are selected when you start the command, **System** is automatically updated with the last used system.

Reporting Requirements

Specifies the reporting requirement for the object. To change the options on the list, edit the **Reporting Type** select list in Catalog.

Reporting Type

Specifies the type of reporting. To change the options on the list, edit the **Reporting Type** select list in Catalog.

Behavior Controlled by User

Indicates whether or not you can delete the object. Select **False** to prevent anyone from deleting the object from the model.

Correlation Status

Specifies whether or not the object has been correlated to an object in a P&ID. The list is defined by the EFWCorrelationStatus select list.

Correlation Basis

Specifies whether or not the object is correlated to a P&ID object. The list is defined by the EFWCorrelationBasis select list.

Correlate Object indicates that the object has a correlating object in a P&ID.

No correlation is required indicates that the object does not have a correlating object in a P&ID.

Correlation Approval Status

Specifies whether or not the object is approved with discrepancies in the three-dimensional data compared with design basis data. The list is defined by the EFWCorrelationApprovalStatus sheet in the AllCodelist workbook.

Topology mismatch approved indicates that the object topology mismatch can be ignored.

Data and Topology mismatches approved indicates that the object data and topology mismatches can be ignored.

None indicates that you do not approve a mismatch.

Position and Orientation

East

Displays the distance of the connection point from the active coordinate system origin in the east direction.

North

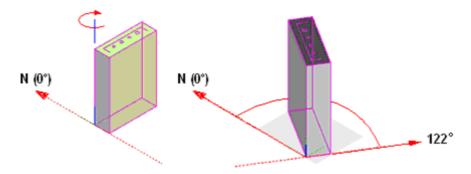
Displays the distance of the connection point from the active coordinate system origin in the north direction.

Elevation

Displays the distance of the connection point above or below the active coordinate system origin.

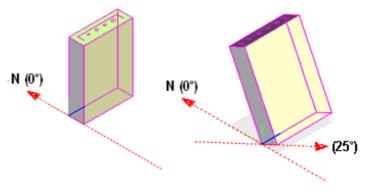
Bearing

Specifies the bearing angle for the object. The **Bearing** angle is measured between the local x-axis of the object and the Y-axis (North) of the global coordinate system in the XY-plane. The local x-axis is the default axis of primary symmetry for all symbols in the catalog. The bearing measurement direction is clockwise from the active coordinate system North looking in the negative active coordinate system direction; that is, down from 0 to 360 degrees. You can enter negative bearing angles, but the software automatically converts them to the positive equivalents. If the pitch is set to +/- 90 degrees, then the bearing measure displays 0 degrees.



Pitch

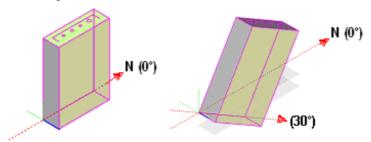
Specifies the pitch angle for the shape. The **Pitch** angle measures between the x-axis of the object and the X-axis of the global coordinate system in the XZ-plane. This option sets the reference in the model to a line that is the intersection of the vertical plane through the X-axis of the local coordinate system and the active coordinate system horizontal plane. The angle is measured in the positive direction from the horizontal plane in the active coordinate system up direction regardless of the current bearing. Another way to describe pitch is the rotation of the object about its y-axis. Pitch angles are limited to between -90 degrees and +90 degrees, with 0 indicating horizontal.



Roll

Specifies the roll angle for the object. The **Roll** angle measures between the local z-axis of the object and the Z-axis of the global coordinate in the YZ-plane. Another way to describe roll is the rotation of the object about its x-axis. This option sets the reference in the model to

a line that is perpendicular to the local coordinate system x-axis and in the horizontal plane. Roll angles are measured clockwise from horizontal to the y-axis of the local coordinate system. The roll angle is between 0 and 360 degrees. You can enter negative roll angles, but the software automatically converts them to the positive equivalents. If the pitch is set to +/- 90 degrees, then the reference in the model is the North axis.



Insulation and Tracing

Is Insulated

Indicates whether or not the object is insulated.

Thickness

Specification box, you cannot change the information in the **Insulation Thickness** box. However, if **Insulation Specification** is manually defined, select the insulation thickness from those values allowed for the material in the reference data. If the value in the **Insulation Specification** field is a selected reference data insulation specification, the software reads the thickness from the insulation specification from the reference data and displays it here.

Requirement

Specifies the requirement of the insulation. To change the options on the list, edit the **Insulation Purpose** select list in Catalog.

Insulation Type

Specifies the type of the insulation. To change the options on the list, edit the **Insulation Purpose** select list in Catalog.

Insulation Purpose

Displays the purpose of the insulation. If **Insulation Specification** is set to use the insulation defined by the equipment object, the information in this box cannot be changed. However, if **Insulation Specification** is manually defined, select the purpose of the insulation in this box. Available purposes are read from the reference data.

Material

Specifies the material of the insulation. If **Insulation Specification** is set to use the insulation defined by the equipment object, this field cannot be changed. However, if **Insulation Specification** is manually defined, select the insulation material from those available from the reference data.

The list contains the last five insulation materials selected. Click **More** to browse the catalog for the insulation material to use. If you set this field to **Not Insulated**, the **Insulation**

Thickness field is disabled. If you set this field to **Use Run Material**, the along leg feature inherits the insulation material from the duct run.

To change the options on the list, edit the **Insulation Material** select list in Catalog.

Operating Temperature

Specifies the operating temperature.

Insulation Surface Area

Specifies the measurement of the surface area of insulation.

Heat Tracing Requirement

Indicates whether or not the equipment is heat-traced. To change the options on the list, edit the **Heat Tracing Medium** select list in Catalog.

Heat Tracing Type

Specifies the type of heat-tracing. To change the options on the list, edit the **Heat Tracing Medium** select list in Catalog.

Heat Tracing Medium

Specifies the heat-tracing medium to apply to the object. To change the options on the list, edit the **Heat Tracing Medium** select list in Catalog.

Heat Tracing Medium Temperature

Specifies the temperature of the heat-tracing medium. Include the unit of measurement of temperature (**K** for Kelvin, **F** for Fahrenheit, or **C** for Celsius, for example).

Weight & CG

Displays the center-of-gravity and the weight of the selected equipment objects. The center-of-gravity locations are displayed in global system coordinates along the X-, Y-, and Z-axes. The software includes the insulation weight in the calculated weight. If you specify the weight yourself, you must include the insulation weight value.

Dry Weight

Specifies the dry weight of the object.

Wet Weight

Specifies the wet weight of the object.

■ NOTE For equipment, the Weight and CG property Wet Weight is the sum of Dry Weight and Water Weight. The dry weight and water weight values are catalog properties entered on the part sheet for the equipment.

Dry CGX

Specifies the X-axis location of the dry center-of-gravity.

Dry CGY

Specifies the Y-axis location of the dry center-of-gravity.

Dry CGZ

Specifies the Z-axis location of the dry center-of-gravity.

Wet CGX

Specifies the X-axis location of the wet center-of-gravity.

Wet CGY

Specifies the Y-axis location of the wet center-of-gravity.

Wet CGZ

Specifies the Z-axis location of the wet center-of-gravity.

Equipment Dimension

Property

Displays the name of the property. The properties that appear are dependent on the equipment type selected. For example, the properties displayed for an equipment object based on a pump are different from those based on a cooler. For more information on equipment part properties, see the *Equipment and Furnishings Reference Data Guide*, available with the **Help > Printable Guides** command within the **Equipment and Furnishings** task.

Value

Displays the value of the corresponding property.

Fabrication and Construction

Fabrication Requirement

Specifies the fabrication requirement for the object. To change the options on the list, edit the **Fabrication Type** select list in Catalog.

Fabrication Type

Specifies the type of fabrication for the object. To change the options on the list, edit the **Fabrication Type** select list in Catalog.

Construction Requirement

Specifies the construction requirement for the object. To change the options on the list, edit the **Construction Requirement** select list in Catalog.

Construction Type

Specifies the type of construction for the object. To change the options on the list, edit the **Construction Type** select list in Catalog.

Surface Treatment and Coating

Exterior Coating Requirement

Specifies the coating requirement for the object. To change the options on the list, edit the **Coating Type** select list in Catalog.

Exterior Coating Type

Specifies the type of coating for the object. To change the options on the list, edit the **Coating Type** select list in Catalog.

Coating Color

Specifies the color of the object coating. To change the options on the list, edit the **Coating Color** select list in Catalog. Smart 3D includes this property in the painting area report.

Exterior Coating Area

Specifies the area of the coating for the object.

Responsibility

Cleaning Responsibility

Specifies the party responsible for cleaning the object. To change the options on the list, edit the **Cleaning Responsibility** select list in Catalog.

Design Responsibility

Specifies the party responsible for designing the object. To change the options on the list, edit the **Design Responsibility** select list in Catalog.

Fabrication Responsibility

Specifies the party responsible for fabricating the object. To change the options on the list, edit the **Fabrication Responsibility** select list in Catalog.

Installation Responsibility

Specifies the party responsible for installing the object. To change the options on the list, edit the **Installation Responsibility** select list in Catalog.

Painting Responsibility

Specifies the party responsible for painting the object. To change the options on the list, edit the **Painting Responsibility** select list in Catalog.

Requisition Responsibility

Specifies the party responsible for ordering the object. To change the options on the list, edit the **Requisition Responsibility** select list in Catalog.

Supply Responsibility

Specifies the party responsible for delivering the object. To change the options on the list, edit the **Supply Responsibility** select list in Catalog.

Testing Responsibility

Specifies the party responsible for testing on the object. To change the options on the list, edit the **Testing Responsibility** select list in Catalog.

See Also

Equipment Properties Dialog Box (on page 200)

Select Insulation Material Dialog Box

Specifies the insulation materials for a selected object. By browsing through the part hierarchy, you can find and select an insulation material in the Catalog database.

■ Save

This option is unavailable.

Cut

This option is unavailable.

Copy 🖺

This option is unavailable.

Paste

This option is unavailable.

Delete

This option is unavailable.

Undo

This option is unavailable.

∃ Insert Row

This option is unavailable.

Move Up

This option is unavailable.

Move Down

This option is unavailable.

Properties

Displays the properties of the selected object. Because you cannot modify any properties until the object is placed, all properties on the **Properties** dialog box are read-only.

Preview

Displays a bitmap symbol of the selected object. The image file must be assigned to the object in the catalog reference data.

Filter

This option is unavailable.

≜↓ Sort

This option is unavailable.

Customize Current View

This option is unavailable.

List View

Sets the dialog box to display insulation thickness values in a list view.

Grid View

Sets the dialog box to display insulation thickness values in a spreadsheet-style grid view.

Back

Returns you to the previously selected insulation material folder. Use this command to

navigate through the hierarchy to the specific insulation material you need.

Forward

Sends you to the last selected insulation material folder that you moved away from by using the **Back** button. Use this command to navigate through the hierarchy to the specific insulation material you need.

Up One Level

Brings up the next highest level of the hierarchy. Use this command to navigate through the hierarchy to the specific material you need.

Check Data

This option is unavailable.

CheckData Ignored Inconsistencies

This option is unavailable.

Smart 3D Help

This option is unavailable.

Address

Sets the current location within the hierarchy of available insulation materials. The dropdown box lists the folders you have visited.

Definition Tab (Equipment Properties Dialog Box)

Displays the part information for the equipment object, the properties and their values, as defined in the reference data. If more than one equipment object is selected, only the common properties for the selected objects display on the tab. For more information about the information defined in the reference data, see the *Equipment and Furnishings Reference Data Guide*, available from the **Help > Printable Guides** command in the software.

Category

Select the properties to review. Equipment information is divided into several different categories, such as **Standard**, **Equipment Specification**, **Equipment Support**, **Nozzle Length**, and **Equipment Dimensions**.

* IMPORTANT Not all categories are available for all equipment objects.

Property

Displays the name of the property. The properties that appear are dependent on the equipment type selected. For example, the properties displayed for an equipment object based on a pump are different from those based on a cooler. For more information on equipment part properties, see *the Equipment and Furnishings Reference Data Guide*, available with the **Help** > **Printable Guides** command within the Equipment and Furnishings task.

Value

Displays the value of the corresponding property.

Connection Tab

Displays information on the connection points of a piece of equipment, including piping, electrical, foundation, or HVAC connections, and Reference 3D objects. If more than one equipment object is selected, only the common properties of the connections for the selected objects display on the tab. For more information about the information defined in the reference data, see the *Equipment and Furnishings Reference Data Guide*, available from the **Help** > **Printable Guides** command in the software.

Connector

Select the connector for which to view properties. With the exception of Reference 3D object connectors, the connectors display in alphabetical order. When you select a connector from the list, the graphic object associated with the connection, if one exists, highlights in the graphic view for further visual confirmation of the port selected.

Property

Lists all the properties of the selected connection. These properties vary depending on the type of connection selected.

Value

Displays the value of the corresponding property.

Insulation Tab

Displays insulation properties that have been defined for the selected equipment.

Insulation Specification

Specifies whether or not the selected equipment object is insulated. The options on this dialog box remain disabled unless **User Defined** is selected from the dropdown list.

Purpose

Specifies the insulation purpose for the selected equipment object.

Material

Displays the **Select Insulation Material** dialog box from which you can specify an insulation material. For more information, see *Select Insulation Material Dialog Box* (on page 131).

Thickness

Defines the thickness of the specified insulation material. This option remains disabled until a material is selected from the **Select Insulation Material** dialog box. By default, the smallest thickness value of the selected material is displayed. An alternative value may be selected from the dropdown list.

See Also

Equipment Properties Dialog Box (on page 200)

SECTION 14

Cables

You can create cables and then route those cables through existing conduit and cableway. You can:

- Assign cable properties
- Automatically route cable
- Edit cable routes including the ability to define where cables enter and exit cable tray
- Insert cable markers and generate a report of the cable route by marker name

Create Cables

You can create cables by defining the name, part number, and equipment to which the cable is connected. For example, you can choose an electrical cabinet and a pump to connect with cable in the model.

You can create parallel cables, if needed. The software creates a parent object called a parallel cable, and children objects called paralleled cables. The paralleled cables have the same part number, have the same entry and exit points into and out of the cableway, and follow the same path in the cableway. The following graphic shows the parallel cable hierarchy in the **Workspace Explorer**.



For more information on creating cables, see *Insert Cable* (on page 214).

AutoRoute Cable

You can automatically route cables using **AutoRoute** on the **Edit Cable Path** ribbon. After a cable is created, you can use **Edit Cable Path** to access the autorouting functionality. Autorouting determines the shortest path from the starting point to the ending point on the cable tray or conduit and routes the cable accordingly. You must define signal types for the cable trays and conduits to autoroute cables. You can modify the assigned autorouted path, if necessary, by specifying additional must-include cable trays for the selected cable.

During the auto route process, the software also considers the cable tray fill requirement. You can choose to allow overfilling of the cable trays or to allow real-time fill calculations during the routing process. For more information about using the autorouting functionality, see *AutoRoute* (on page 230).

Edit Cable Path

After the software automatically routes the cable, you can edit the cable path so that the cable runs through the proper cable trays. You need to define the cable entry point into the cableway

system, the cableways and conduit that the cable is to go through, and the cable exit point from the cableway system. If you do not have conduit and cableways in your model, use the **Route**

Conduit and Route Cableway From commands to create them.

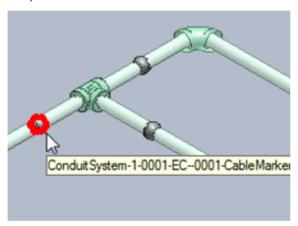
As you route a cable, you can view the maximum fill capacity for the cable tray or conduit in the **MaxFill** box on the ribbon. If you click **MaxFill**, the software highlights the corresponding tray or conduit containing the maximum fill. You can use surface style rules to show which cable trays are full and which ones are nearly full. You can also run a cable fill report for cable tray or conduit.

The software also calculates the maximum fill during the autorouting process. You can allow overfilling of the cable trays or allow real-time fill calculations during the routing process.

NOTE Fill calculations are based on the National Electrical Code (NEC) standard. The software performs the calculations using Microsoft Visual Basic module, which can be customized based on the requirements of a given project. For more information about editing cable paths, see *Edit Cable Path* (on page 221).

Place Cable Marker

After you route cables, you can place markers on cableway or conduit features to designate the path of the cables. You can later generate a report on the paths and use the information as required. For more information about placing cable markers, see *Insert Cable Marker* (on page 234).



Routing Cable Example

When routing cable manually, you might want to route a cable into a cable tray at some point along the tray's length. For example, the cable needs to exit a conduit and then enter a cable tray.

You can specify an entry point or exit point anywhere along a cable tray using **Set Entry Point** or **Set Exit Point** on the ribbon. **PinPoint** can be used to assist in precise placement.

For example, if you branch the conduit out of the tray using **Route Conduit**, the software creates a connection between the conduit and cableway features. Then, when routing the cable, you need to select the cableway that owns the tray, and then do the same for the conduit run in

the **Select Way Features** step. The software recognizes the connection between the cableway and conduit runs, and routes the cable through them.

There is no need to route cable in any specific order. You can pick whatever step you want to start the process and then come back to it later, if required. Incomplete routes can be saved and finished later. Additional cables can even be added while routing. When you click **Finish**, the runs are saved.

Routing Cable in Disconnected Networks

The following information concerns the connectivity of cable tray networks and how the connectivity affects a cable route.

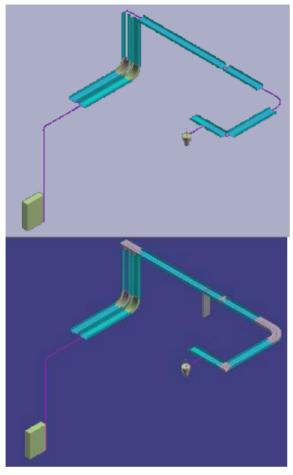
When you route cable, the cable makes a jump from the From Device to the Entry Point and a jump from the To Device to the Exit Point, following an orthogonal path in both cases. The software does not jump between disconnected cable trays or conduit runs. A connection is required between the conduit feature and the cable tray feature. Without the connection, the software does not know to trim the path at that branch.

Where there are gaps between cable tray runs, you should route zero spec cableway (Cws-0). With this spec, no parts are created – only space is reserved. However, the software still makes connections that cable routing will recognize. Hence, you can fill in gaps with this spec and allow the cable routing to have a contiguous network through which to route.

Using zero-spec cableway, a cable path can be routed across a variety of gap conditions.

- A tight radius turn for which no elbow has been placed
- A longer radius turn
- A gap between two trays in the same plane
- A gap between a horizontal and vertical tray

The following pictures show a disconnected cable tray network. The cable appears to jump over the gaps. Actually, the cable trays are connected using zero-spec cableway, which is hidden in the first picture (and shown in the second picture). The cable path is complete and gives good data as a result.



NOTES

- Exit points for cable can be placed anywhere along a tray. A cable can leave a tray at any point, connecting to an equipment or instrument.
- To check the validity of a cable, open the Properties dialog box for the cable, and go to the Occurrence tab. The Route Status value will be Incomplete or Undefined if the cable is routed through a non-contiguous network. In this case, the lengths cannot be relied upon, and the data is not valid.
- Zero-spec cableway is used in interference detection to assure there is space for the cables to make the jump across gaps in the tray network.

Routing Cables in Cable Tray with Barriers

Adding barriers to cable tray with cables

You can add barriers to a cable tray that already has cables of different signal routed through it. When you add barriers and assign required signal types to the partitions, the software automatically routes the cables in partitions based on their signal type. You need not manually assign cables to respective partitions.

For example, a cable tray has Communication, Control, and Power cables routed through it. When you create three partitions out of the cable tray, the software automatically routes the control cable in partition assigned with Control signal type and so forth based on their signal type.

Deleting a partition with cables

If you delete a partition with cables, the software deletes that partition and unroutes the associated cables. The **Route status** of the cable is set to **incomplete**. For information on how to delete a cable tray partition, see *Delete a cable tray barrier* (on page 153).

Converting a cable tray with barriers to a cable tray

To convert a cable tray with barriers to a cable tray, you should delete all the partitions. If you delete all the partitions, the software unroutes the associated cables except the cables in the remaining partition. The software renders the last remaining partition into a cable tray, and the signal type of that partition is assigned to the cable tray. For information on how to delete a cable tray partition, see *Delete a cable tray barrier* (on page 153).

Insert Cable

Creates a new cable run in the model. When you add a cable run, you define the properties of the cable run and define the relationship of the cable run to other objects in the model, such as electrical cabinets and equipment.

You can create parallel cables, if necessary, by entering a number greater than 1 for the parallel cables property. The software creates a parallel cable (parent) and multiple paralleled cables (children).

After you insert a cable, the **Edit Cable Path** ribbon becomes available. For more information about this ribbon, see *Edit Cable Path* (on page 221).

What do you want to do?

- Create a cable (on page 214)
- Copy a cable run (on page 216)

Create a cable

1. Click Insert Cable .

The Cable Properties dialog box displays.

- 2. In the **System** box, select a system for the cable. Select **More** to select a system from the workspace or database.
- 3. In the Name box, type a name, or select DefaultNameRule in the Name Rule box.
- 4. In the **Parallel Cables** box, specify an integer greater than 1, if you want to create parallel cables. For example, if you enter 2, the software creates two paralleled cables (children) with a parent parallel cable object.
- 5. In the **Signal Type** box, choose a type for the cable.
- 6. In the **Part Number** box, click **More** to browse the catalog for a cable.
- 7. In the Select Part Number dialog box (on page 217), select a cable from the catalog.
- 8. Click OK.
- 9. In the **Originating Device** box, define the originating device connection.
- 10. In the **Terminating Device** box, define the terminating device connection.

TIPS

- The originating and terminating devices can be the same or different pieces of equipment.
- If a piece of equipment has a cable port, the Receptacle, Terminal, Connector, and Backshell (or a combination of these) values for the equipment are available for selection.
- 11. To continue entering cables, click Apply and then click Insert Next Cable.
- 12. Click **OK** to create the cable, and then dismiss the dialog box.

■ NOTES

- After you create a cable and click **OK**, you can edit the cable path in the model. Click **Set** Entry Point on the ribbon, and follow the prompts on the status bar.
- You can specify automatic cable routing. Click AutoRoute on the ribbon that appears after you create a cable. Autorouting places the cable based on the shortest path between the starting point and the ending point on the cable tray.

Copy a cable run

- 1. Click Select &.
- 2. In the Locate Filter box, select Cables.
- 3. Select a cable in a graphic view or in the Workspace Explorer.
- 4. Click Edit > Copy.
- 5. Click Edit > Paste.
- 6. On the **Paste Special** box, define the originating and terminating devices for the cable.

Edit cable properties

- 1. Click Select .
- 2. Select Cables in the Locate Filter box.
- 3. Select the cable run to edit.
- 4. Click **Properties** on the ribbon.

Edit parallel cable properties

- 1. Click Select .
- 2. Select Parallel Cables in the Locate Filter box.
- 3. Select the parallel cable to edit.
- 4. Click **Properties** on the ribbon.

Edit paralleled cable properties

- 1. Click Select &.
- 2. Select Cables in the Locate Filter box.
- 3. Select the paralleled cable to edit.
- 4. Click **Properties** on the ribbon.

Delete a cable run

- 1. Click Select .
- 2. Select Cables in the Locate Filter box.
- 3. Select the cable run to delete.
- 4. Click **Delete** X.

Delete a parallel cable

- 1. Click Select &.
- 2. Select Parallel Cables in the Locate Filter box.
- 3. Select the parallel cable to delete.
- 4. Click **Delete** X.

All the paralleled cables (children) are deleted as well.

Delete a paralleled cable

- 1. Click Select .
- 2. Select Cables in the Locate Filter box.
- 3. Select a paralleled cable to delete.
- 4. Click **Delete** X.

This delete operation does not affect the paralleled cable's parent or siblings.

Select Part Number Dialog Box

Allows selection of the type of cable to be placed. This dialog box appears when you click **More** on the **Part Number** option. By browsing through the hierarchy, you can find any cable part in the Catalog database.



Returns you to the previously selected cable type or node. Use this command to navigate through the hierarchy to the specific type that you need.

→ Forward

Sends you to the last selected cable type or node that you moved away from by using the **Back** button. Use this command to navigate through the hierarchy to the specific type that you need.

違 Up One Level

Brings up the next highest level of the catalog hierarchy. Use this command to navigate through the hierarchy to the specific type that you need.

Copy

Copies the selected object. This command is available only in the Catalog task.

Paste

Pastes a copied object. This command is available only in the Catalog task.

X Delete

Deletes the selected object. This command is available only in the Catalog task.

Undo

Reverses the most recent operation. This command is available only in the Catalog task.

∃ New Object

Creates a new object. This command is available only in the Catalog task.

Move Up

Moves up one object. The level in the hierarchy remains the same.

Move Down

Moves down one object. The level in the hierarchy remains the same.

Properties

Displays the properties of the selected cable type. Because you cannot modify any properties until the cable type is placed, all properties on the dialog box are read-only.

Preview

Displays a picture of the selected cable type. The image file must be assigned to the cable type in the reference data.

List View

Sets the dialog box to display cable types in a list view.

Grid View

Sets the dialog box to display cable types in a spreadsheet-style grid view.

March Check Data

Checks the consistency of the data in the grid against other data in the Catalog. This command is available only in the Catalog task.

Address

Specifies your exact location within the displayed hierarchy.

Cable Properties Dialog Box

Displays cable properties for review and editing.

The **Parallel Cable** and **Paralleled Cable** tabs appear if you have created parallel cables. The **Parallel Cable** tab is for the parent cable object, and the **Paralleled Cable** tab is for a child cable.

See Also

Configuration Tab (on page 275)
Edit Cable Properties (on page 216)
Edit Parallel Cable Properties (on page 216)
Edit Paralleled Cable Properties (on page 216)
Insert Cable (on page 214)
Relationship Tab (on page 278)
Route Tab (Cable Properties Dialog Box) (on page 220)
Parallel Cable Tab (Cable Properties Dialog Box) (on page 219)
Paralleled Cable Tab (Cable Properties Dialog Box) (on page 219)

Parallel Cable Tab (Cable Properties Dialog Box)

The **Parallel Cable** tab displays the object properties as they are defined in the reference data. The property name appears on the left side of the grid and the corresponding property value appears on the right side of the grid. If you selected more than one object and then selected the **Properties** command, only the common properties between the selected objects display.

The properties that appear depend on what you defined in the reference data. For more information on the properties, refer to the *Electrical Reference Data Guide* available from the **Help > Printable Guides** command in the software.

See Also

Edit Properties (on page 157)

Paralleled Cable Tab (Cable Properties Dialog Box)

The **Paralleled Cable** tab displays the object properties as they are defined in the reference data. The property name appears on the left side of the grid and the corresponding property value appears on the right side of the grid. If you selected more than one object and then selected the **Properties** command, only the common properties between the selected objects display.

The properties that appear depend on what you defined in the reference data. For more information on the properties, refer to the *Electrical Reference Data Guide* available from the **Help > Printable Guides** command in the software.

See Also

Edit Properties (on page 157)

Route Tab (Cable Properties Dialog Box)

Displays the route of the cable run. This tab is only available if the cable has been routed.

Method

Specify how you want to view the cable run route.

- Cableways Lists all the cableway junctions that the cable run passes through. The
 cableway junctions are named after the cableway or conduit run names and the end of
 the cableway or conduit run that the cable run passes.
- All Hangers Lists all hangers supporting the cableways that the cable run route passes through.
- Key Hangers Lists only the hangers that are closest to the entry and exit points and any branch points.
- Markers Lists the cable markers on the cable run.

Name

Displays the name of the object.

Location X

Displays the X-coordinate location of the hanger, marker, and cableway junction in the active coordinate system.

Location Y

Displays the Y-coordinate location of the hanger, marker, and cableway junction in the active coordinate system.

Location Z

Displays the Z-coordinate location of the hanger, marker, and cableway junction in the active coordinate system.

Distance

Displays the distance from where the cable run enters the cableway system to the hanger. The distance is measured along the centerline of the cableway and includes any tail 1 length that was specified at creation.

See Also

Cable Properties Dialog Box (on page 219)

Edit Cable Path

Routes cables through connected cableways and conduits. You can define the path of a cable path by either manually selecting the entire path or by automatic calculation of the shortest route that meets your predefined criteria (cableway signal types, way-features, avoidance features, entry and exit points).

To define the path manually, select the entry point, the way features through which the cable should pass, and then the exit point.

To define the path automatically, you need to optionally define the required entry/exit points, the way-features (branch features the route must go through), and the avoidance features (straight features the route must avoid). Then click **AutoRoute**, and the software finds the shortest route.

■ NOTES

- The cable must exist in the model before you can define the path. Use Insert Cable to create cables.
- The cableways and conduit that the cable routes through must be connected. Cables cannot jump between unconnected cableways/conduits. To place cableways and conduits, use the Route Cableway and Route Conduit commands.
- A way feature represents combination of way node and way path through which you route the cable.
 - Way node is along-leg feature or a feature that has branch.
 - Way path is a straight, turn or transition feature.

Edit Cable Path Ribbon

Sets options for routing cables.



Property Page

Displays the **Cable Properties** dialog box. For more information, see *Cable Properties Dialog Box* (on page 219).

Cable List

Displays a dialog box that lists all the defined cables in the model. To define a cable, click **Insert Cable** .

Select Cable(s)

Select one or more cables to edit the path. For manual routing, all selected cables follow the same path. For autorouting, the shortest path that meets your criteria is found independently for each selected cable

Set Entry Point

Identify the entry point into the cableway for the cable path near the originating device. This point must be either at an end feature of a conduit or cableway or a point along a cableway

straight feature, along leg feature, or turn feature. This option is required for manual routing and optional for autorouting.



Select Way Features

Select the cableway and conduit straight features, branch, turn features except end features, in the order (from entry to exit) that you want the cable to run through. When you select a straight feature, the software extends the selection along the cableway header. You select another straight feature at each branch that you want the route to take. Selecting a currently selected way feature de-selects that feature. You only have to select a few way features to get a path that deviates from the ideal shortest route as your design conditions require. When you select a cable that has been autorouted, you can click Select Way Features to review the way features you previously selected and edit their order. See Show Order of Way Features in below for more information.

Select Avoidance Features

Select the cableways and conduit straight features through which the cable cannot pass. This option is only used when autorouting. Although this option is sometimes useful to quickly define the required route, Avoidance features are not stored with the resulting cable route for later possible re-route of the cable as are way-features. As such, it is more effective to use way-features.

Set Exit Point

Identify the exit point from the cableway for the cable path near the terminating device. This point must be either at an end feature of a conduit or cableway or a point along a cableway straight feature, along leg feature, or turn feature.

Finish

Saves the cable route as defined to the database.

X Reject Selection

Rejects the selected object.

Accept Selection

Confirms the selected set of objects.

Delete Path Selection

Deletes the currently defined paths of the selected cables.

AutoRoute

Automatically routes each selected cable through the shortest path that has the required signal type and meets the currently defined entry/exit points, way-features, and/or avoidance features. If the autoroute produces unexpected results, ensure that the following conditions exist:

- The allowed signal types defined for the cableways include the cable signal type.
- The cableways are connected. Verify that you have branch features at branch points.
- The equipment is within your required range from the cableways. For more information, see AutoRoute Options Dialog Box (on page 231).
- The way features that you have selected are in an order from the entry to the exit that is possible.

- The selected way features do not exceed 100.
- The selected way paths do not exceed 20.

Partial Autoroute

Reroutes a selected portion of an already autorouted cable, keeping the rest of the cable path unchanged.

AutoRoute Options

Specifies autorouting options. The software allows either overfilling of cableways or real-time fill calculations among other options. For more information, see *AutoRoute Options Dialog Box* (on page 231).

Show Order of Way Features

Activates the **Order of Way Features** dialog box, which displays the originating and terminating devices for the cable and the order of the way features that the cable will pass through when autorouted. By default, the software finds the shortest path through all the way features. If the shortest path is not appropriate, you can re-order the way features using **Show Order of Way Features**. Open the dialog box and click **OK** to confirm that the selected order should be considered for auto-routing. Otherwise, the software picks the path through the selected way features. In this case, the order is decided by the software.

System

Defines the parent system for the cable.

Cable name

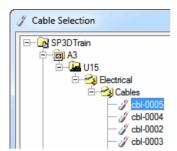
Displays the name of the cable.

What do you want to do?

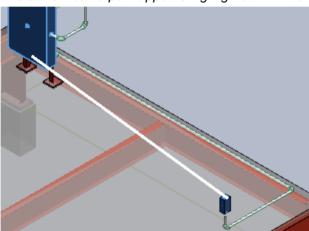
- Edit cable path manually (on page 224)
- Set avoidance zones (see "Set avoidance features" on page 227)
- Set way features (on page 227)
- Copy cable path (on page 228)
- Order features for autorouting cable (on page 228)
- Re-route part of a path (on page 229)

Edit cable path manually

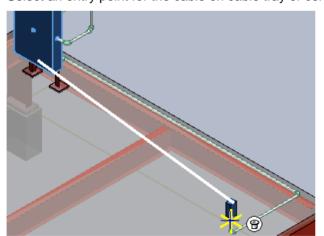
- 1. Click Edit Cable Path 🏃
- 2. On the Cable Selection dialog box (on page 232), select a cable to edit.



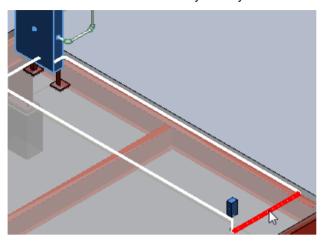
The current cable path appears highlighted in white in the model.



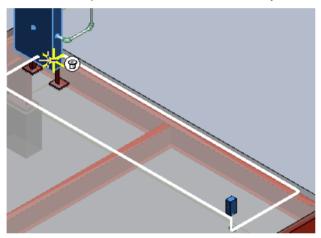
- 3. Click **Accept** ✓ to confirm that you want to edit the path for this cable.
- 4. Select an entry point for the cable on cable tray or conduit.



5. Select the conduit and cable trays that you want the cable to run through.



- 6. Click Accept <
- 7. Select an exit point for the cable on cable tray or conduit.



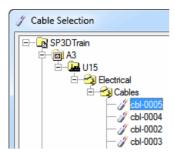
- 8. Click Accept <
- 9. Click Finish.

NOTES

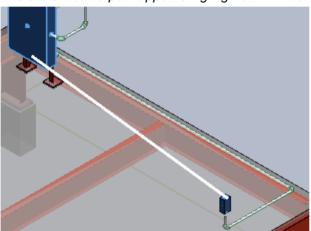
- For the entry and exit points, you can select a point on a cable tray straight feature, turn feature, or along-leg feature (including an end feature), a point on a conduit end feature, or a hanger or support on a cable tray or conduit run.
- To aid in selecting hangers, use the SmartSketch3D relationship indicators, or select the hanger in the Workspace Explorer. You can also use a locate filter to select the straight features, and then hide the straight features before selecting the hangers.

Edit cable path using AutoRoute

- 1. Click Edit Cable Path 🦫
- 2. On the Cable Selection dialog box (on page 232), select a cable to edit.

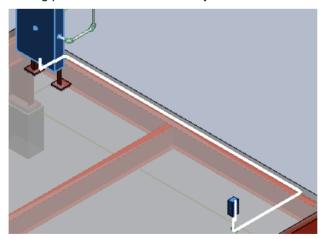


The current cable path appears highlighted in white in the model.



- 3. Click **Accept** \checkmark to confirm that you want to edit the path for this cable.
- 4. Click **AutoRoute** $\textcircled{\bullet}$ on the ribbon.

Autorouting places the cable based on the shortest path between the starting point and the ending point. Click **AutoRoute Options** on the ribbon to set options for overfilling.



5. Click Finish.

Set avoidance features

- 1. Click Select &.
- 2. Select **Cable** in the **Locate** filter box, and then select a cable in a graphic view or in the **Workspace Explorer.**
- 3. Click **Select Avoidance Features** \bigcirc , and then select the cableway features through which you do not want the cable routed.
- 4. Click AutoRoute 😃

The cable is routed along the shortest path through features other than the ones selected as avoidance features. The combination of setting avoidance features and using **AutoRoute** constrains the cable to avoid features while choosing the optimum path.

■ NOTES

- Use avoidance features to ensure that AutoRoute (on page 230) does not route a cable through specified cableway features. You must have a cable already placed and selected to open the Edit Cable Path ribbon.
- You do not have to select the entry and exit points because the autoroute feature picks them. However, if there are any numbers of cableways lying in the maximum tail range of the equipment, then you might want to select the entry and exit points.
- This feature works only with autorouting.

Set way features

- 1. Click Select
- 2. Select **Cable** in the **Locate** filter box, and then select a cable in a graphic view or in the **Workspace Explorer**.
- 3. Click **Select Way Features** , and pick the cableway or conduit features through which you want the cable routed.
- Click AutoRoute
- 5. Click Finish when you are done.

You can watch the cable passing through the features defined as Way Features.

■ NOTES

- Use Way Features to ensure the auto route feature routes a cable the way you intend. You
 must have a cable already placed and selected to open the Edit Cable Path ribbon.
- You do not have to select the entry and exit points because AutoRoute picks them. However, if there are any numbers of cableways lying in the Maximum Tail range of the equipment, then you might want to select the entry and exit points.
- A combination of way features and avoidance features can be selected for autorouting cables.

 AutoRoute finds the shortest route that goes through all selected branch features (wayfeatures) in the order in which they were selected.

Copy cable path

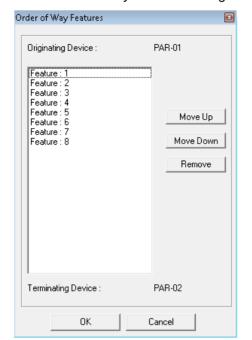
- 1. Click Edit Cable Path $\stackrel{1}{\triangleright}$.
- 2. Select the cable with the path that you want to copy.
- 3. Select the unrouted cable to assign the path to.
- 4. Click **OK** to confirm the copy operation.

Order features for autorouting cable

- 1. Select a cable from Workspace Explorer.
 - -OR-
 - Click Edit Cable Path $\stackrel{1}{>}$.
- 2. Select the cables in the Cable Selection dialog box, and click OK.
- 3. Click **Accept** ✓ to accept the selection.
- 4. Click **Select Way Features** \Rightarrow and select the cableway or conduit features in the network through which you want the cable to pass when routed using **AutoRoute**.

■ NOTES

- The software finds the shortest path between the entry and exit points, through all the way features. You can re-order the way features if the autorouted path is not appropriate.
- Do not select more than 100 way features as this can cause AutoRoute to route inappropriately.
- 5. Click Show Order of Way Features in on the Edit Cable Path ribbon.



6. In the Order of Way Features dialog box (on page 232), select a feature to re-order.

The feature you select in the dialog box is highlighted in the graphic view of the software.

- 7. Click Move Up or Move Down to change the order of selection.
 - **NOTE** To remove a selected way feature from the list, click **Remove**. This action does not remove the branch feature from the model.
- 8. If necessary, select additional way features, and repeat step 5 until the order is correct.
- 9. Click **OK** to save the way features changes or click **Cancel** to undo the changes made.
- 10. Click AutoRoute .

The cable passes through the way features according to the modified order of way features.

Re-route part of a path

You can use **Partial Autoroute** on the **Edit Cable Path** ribbon to re-route a portion of a cable that is currently complete. When modifying the way features, do not select straight features. Select only features with branch points. After you modify the cable path, **Partial Autoroute** does not consider straight features but remembers the last saved along-leg features. The command can modify the selected cable in the following ways:

Partial autoroute between existing entry and exit points

- Select the cable.
- 2. Click Partial Autoroute 🕏.

The software uses the current entry and exit points and all of the way-features that were selected for the last run of the **AutoRoute** command to find the shortest path between the existing entry/exit points.

Partial autoroute between two points on the current path of the cable

- 1. Select the cable.
- 2. Click Select Way Features 🌙 on the Edit Cable Path ribbon.
- 3. Select a start branch point on the path of the cable, followed by a series of branch points through which you intend the cable to pass.
- 4. Select the end branch point on the path of the cable.
- 5. Click Partial Autoroute 💆

The software re-routes the cable through the selected branch points, retaining the path before and after the first and last branch points that you selected.

Partial autoroute between the entry point and a point on the current path of the cable

- Select the cable.
- 2. Re-select the entry point on the same straight feature that it was currently on.
- 3. Select the series of branch points through which you intend the cable to pass.
- 4. Select the end branch point on the path of the cable.
- 5. Click Partial Autoroute 🕏.

The software re-routes the cable from the entry point through the selected branch points, retaining the path after the last branch point selected on the path.

Partial autoroute between a point on the current path of the cable and the exit point

- 1. Select the cable.
- 2. Re-select the exit point on the same straight feature that it was currently on.
- 3. Select the series of branch points through which you intend the cable to pass, starting with a branch point on the path of the cable and in order toward exit point.
- 4. Click Partial Autoroute 🕏.

The software re-routes the cable through the selected branch points, retaining the path before the first branch point selected on the path.

AutoRoute

Poutes cables using the shortest path from a starting point to an ending point via a cable tray or conduit. In addition, you can choose to allow overfilling of the cable trays or to allow real-time fill calculations during the routing process.

Autorouting is off by default; click **AutoRoute** on the **Edit Cable Path** ribbon to activate autorouting.

■ NOTE The software computes the cable path such that the cable enters/exits at the nearest entry/exit point available within the maximum tail range, and the maximum length of the cable remains in the cable tray or conduit. For a detailed explanation of the process the software steps through to autoroute cable in the 3D model, see *Appendix: Cable Autorouting* (on page 306).

See Also

AutoRoute Options Dialog Box (on page 231)

AutoRoute Options Dialog Box

Sets options for automated routing. Access these options by clicking AutoRoute Options 😃 on the Edit Cable Path ribbon.



Allow overfilling of cabletrays

Allows for routing of cables through cable trays that will be overloaded. However, even when this option is enabled, the software searches for the cable route that will result in the leastfilled condition. By default, this option is selected.

Allow Cables to enter from the Cableway straight feature

Allows cables to enter from a cableway straight feature.

Allow Cable to be routed through Bends with radii less than Minimum Bend Radius of the Cable

Allows cable routing through bends that have a radius less than the minimum bend radius of the cable.

Cableway, conduits, or cables have been modified since last auto route

Regenerates new cableway network layout data. If you do not select this option, the software does not regenerate the data, but uses cableway network data from the last autorouted cable. By default, this option is selected.

Display range boxes if less than 10 cables are selected

Displays a range box around the cable connection location to the equipment, showing a graphical representation of the maximum and minimum tail ranges.

Refresh the Fill for Cableways in session from database

Retrieves the last fill for cableways from the database. This option is automatically enabled when Allow overfilling of cabletrays option is cleared.

Maximum tail range from Originating device

Allows you to set a specific, maximum search distance from the originating device. In addition, the software computes the shortest cable length for any search results. For example, if two conduits are the same distance from the cable tail, but one is 3 feet long and one is 6 feet long, the software connects to the shortest route—in this case, the 3-foot route.

Maximum tail range from Terminating device

Allows you to set a specific, maximum search distance from the terminating device. In addition, the software computes the shortest cable length for any search results. For example, if two conduits are the same distance from the cable tail, but one is 3 feet long and one is 6 feet long, the software connects to the shortest route—in this case, the 3-foot route.

Route cables through Electrical Raceway networks in the workspace only

Routes cables through the electrical raceway networks that are available in the Workspace, rather than through the entire electrical raceways available in the database. Check this option to route through the raceways available only in the workspace. Clear this option to include all the electrical raceways in the database.

Enable routing based on Allowable and Avoidance Volumes

Routes cables through allowable volumes avoiding the avoidance volumes. If you check this option the software routes the cable only in the allowable volumes. However, this path might not be the shortest path. Clear this option to disable routing based on allowable volumes rule.

See Also

Cables (on page 210)

Edit Cable Path (on page 221)

Routing Cable Example (on page 211)

Routing Cable in Disconnected Networks (on page 212)

Cable Selection Dialog Box

Displays all of the defined cables so that you can select the cable that you want. To define new cables, use the **Insert Cable** command. For more information about creating cables, see *Create a cable* (on page 214).

See Also

Cables (on page 210)
Copy Cable Path (on page 228)
Edit Cable Path (on page 221)
Routing Cable Example (on page 211)
Routing Cable in Disconnected Networks (on page 212)

Order of Way Features Dialog Box

The Order of Way Features dialog box displays the order of the way features selected through which a cable is autorouted. Way features are added to this dialog box using the **Select Way** Features solution on the **Edit Cable Path** ribbon.

Cables are routed through the way features in the order that they are displayed in the dialog box (top to bottom). The name of the cable's originating device is displayed at the top of the dialog box. The cable's terminating device is displayed at the bottom of the dialog box.

Use the **Move Up**, **Move Down**, and **Remove** commands to re-order the way-features as needed. You can select a way feature in the list to highlight its location in the model. You must click **OK** to apply the order changes made to way features. If you do not want the changes to be applied, then click **Cancel** or exit the dialog box.

★ IMPORTANT You must order the way features to define an achievable route or the cable autorouting might fail.

See also

Order Features for AutoRouting Cable (on page 228) Re-route Part of a Path (on page 229)

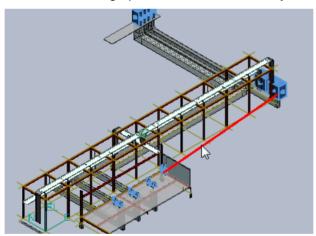
Set View by Cable

The **View > Set View by Cable** command assists the designer when routing cable by only showing objects of interest and hiding non-applicable objects in the model. Because routing cable typically occurs toward the end of the design process, there is a high likelihood that the model will be crowded. This command:

- Hides structural, piping, HVAC, and other objects that the electrical designer is not interested in.
- Hides all equipment not associated with the selected cable.
- Displays all conduit and cableways that are in the immediate vicinity of the equipment being selected. These objects are the most likely to be used for connecting the equipment with cable.
- Displays all conduits and cableways connected to those in the vicinity. As an extra measure to ensure that a viable cableway or conduit is not left out, the branches are included as well.
- Displays all conduits and cableways that the cable currently runs through (if any).
- Shows hangers supporting these cableways and conduits. These hangers can be important reference points during the routing operation.
- Automatically zooms to view the volume of interest.

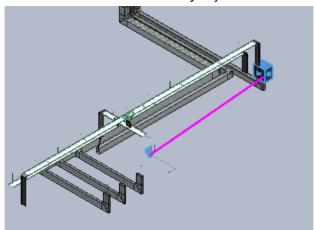
Zoom to cable

- 1. Click Select &.
- 2. Select Cables in the Locate Filter box.
- 3. Click a cable in a graphic view or in the Workspace Explorer.



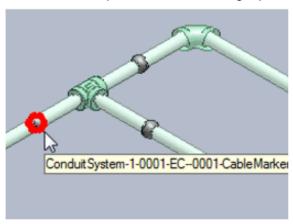
4. Click View > Set View by Cable.





Insert Cable Marker

Places cable markers at points along cable tray or conduit features. You can name the markers yourself or use a naming rule. After being placed, the cable markers can be used to describe a cable path on a cable-routing report.



Insert Cable Marker Ribbon

Sets options for inserting cable markers.

Properties

Displays the **Cable Marker Properties** dialog box. For more information, see *Cable Marker Properties Dialog Box* (on page 238).

Select Path Feature

Allows you to select a feature (cableway or conduit) in the model.

Place Marker on Feature

Allows you to click the location where you want the cable marker.

Marker Name

Type a name for the marker.

Edit Cable Marker Ribbon

Displays options for editing a cable marker.

Properties

Displays the **Cable Marker Properties** dialog box. For more information, see *Cable Marker Properties Dialog Box* (on page 238).

Marker Name

Type a name for the marker.

Parent Run

Displays the name of the electrical run (cableway or conduit) associated with the cable marker.

Raceway Part

Displays the cable tray part associated with the cable marker, if applicable.

Ε

Displays the location of the marker along the E-axis.

Ν

Displays the location of the marker along the N-axis.

EL

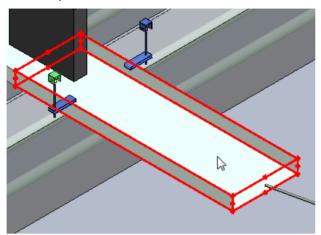
Displays the location of the marker along the EL-axis.

What do you want to do?

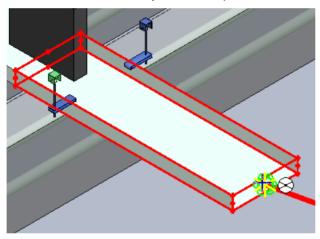
- Insert a cable marker (on page 236)
- Edit cable marker properties (on page 237)
- Move a cable marker (on page 237)
- Delete a cable marker (on page 238)

Insert a cable marker

- 1. Click Insert Cable Marker .
- 2. Select a path feature in the model. You can select cableway or conduit.

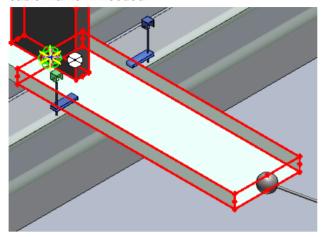


3. Click the location where you want to place the cable marker.



The cable marker is placed and the software prompts you to select the location for another

cable marker if needed.



4. Right-click to stop placing cable markers on the selected feature.

Edit cable marker properties

- 1. Click Select .
- 2. Select Cable Markers in the Locate Filter box.
- 3. Select the cable marker to edit.
- 4. Click **Edit > Properties** or click **Properties** on the ribbon.

Move a cable marker

- 1. Click Select .
- 2. Select Cable Markers in the Locate Filter box.
- 3. Select the cable marker to move.
- 4. Select **Move** $ext{$\oplus$}$ on the main ribbon.
- 5. Select a location in the model as the move-from location.
- 6. Click on the cableway/conduit feature and identify the move-to location.

▶ NOTE You can use the **Tools > Point Along** and **Tools > PinPoint** commands to help locate the marker more precisely.

Delete a cable marker

- 1. Click Select .
- Select Cable Markers in the Locate Filter box.
- 3. Select the marker to delete.
- 4. Click Delete X.

Cable Marker Properties Dialog Box

Displays cable marker properties for review and editing.

See Also

Configuration Tab (on page 275)

Edit Cable Marker Properties (on page 237)

General Tab (Cable Marker Properties Dialog Box) (on page 238)

Relationship Tab (on page 278)

General Tab (Cable Marker Properties Dialog Box)

Displays and defines the general properties of the selected cable marker.

Standard

Marker Name

Specifies the name of the cable marker.

Naming Rule

Specifies the name rule used to generate the name. Set this option to **User Defined** if you want to specify the name yourself.

Parent Run

Specifies the name of the electrical run (cableway or conduit) associated with the cable marker.

Raceway Part

Displays the cable tray part associated with the cable marker, if applicable.

Ε

Displays the location of the marker along the E-axis.

Ν

Displays the location of the marker along the N-axis.

EL

Displays the location of the marker along the EL-axis.

See Also

Cable Marker Properties Dialog Box (on page 238)

SECTION 15

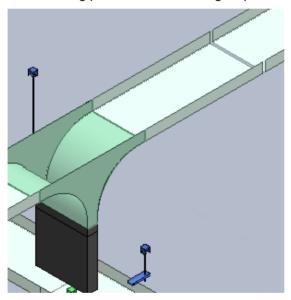
Insert Split

Divides cable tray into sections. Some examples of splits are splice plates, box connectors, and bonding jumpers.

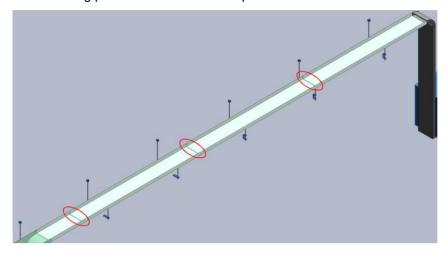
After you route cable tray and cableway, you can insert splits so that the model represents the lengths of tray available for purchase. Splits also let you know where hangers and supports will need to be placed.

The **Insert Split** command allows you to divide a length of tray into sections. The software provides two modes of inserting splits: 1) one split at a time, or 2) many splits at once. In the multi-split mode, the software places splits on a straight feature at locations specified by the purchase length of the tray.

The following picture shows the single-split mode.



The following picture shows the multi-split mode.



■ NOTES

- Cable trays with splits can be logically connected with other cable trays of similar crosssection. They can also logically connect with cableway runs with or without parts.
- Cable trays with dividers do not form transitions. The connecting cableways always form the transition.

Insert Split Ribbon

Sets options for adding a split to a cable tray.



Selects the cable tray in which you want to insert a split.



Specifies the position of the split along the straight feature. This option is available if you are working in single-split mode (see **Split Mode** below), but it is not available if you are working in multi-split mode.

Finish

Inserts the split.

Section Length

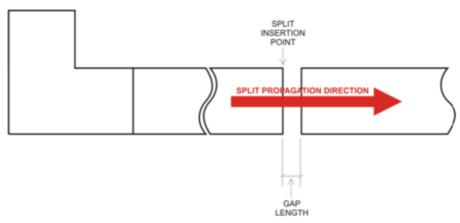
Specifies the purchasable length of the cable tray.

If the length of the selected cable tray straight feature is less than the last-used section length, then the software sets the section length to half of the straight feature length.

Gap Width

Enter the gap between straight sections. The following picture shows where the gap is

placed.



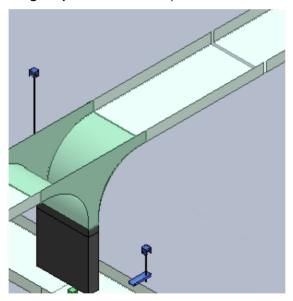
Reference Position

Inserts splits in the selected straight feature starting from Port 1 or Port 2 (either end of the straight feature).

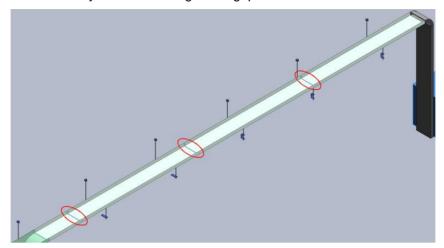
Split Mode

Specifies the mode for inserting splits.

• Single-Split - Inserts one split at a time.



 Multi-Split - Inserts many splits along the feature. The distance between them is determined by the section length and gap width.

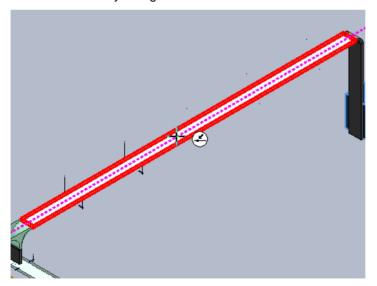


What do you want to do?

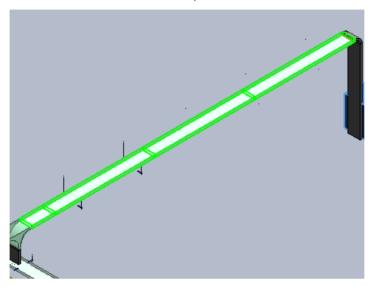
- Insert multiple cable tray splits (on page 242)
- Insert a single cable tray split (on page 244)
- Insert a single cableway split (on page 245)

Insert multiple cable tray splits

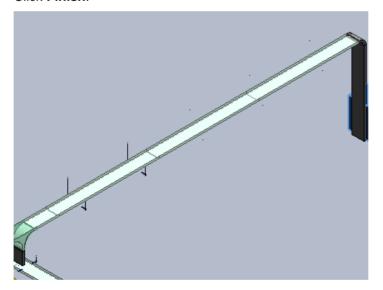
- 1. Click Insert Split .
- 2. Select a cable tray straight feature.



- 3. In the **Split Mode** box, select **Multi-Split**.
- 4. In the **Section Length** box, specify the length between splits.
- 5. In the **Gap Width** box, enter a value for the gap.
- 6. In the Reference Position box, choose Port 1 or Port 2.

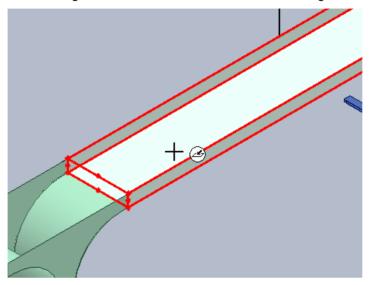


7. Click Finish.

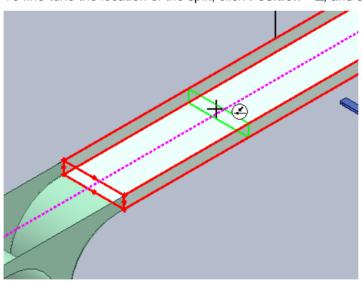


Insert a single cable tray split

- 1. Click Insert Split 🕏.
- 2. Click a cable tray straight feature.
 - TIP If the length of the selected cable tray straight feature is less than the last-used section length, then the software sets the section length to half of the straight feature length.



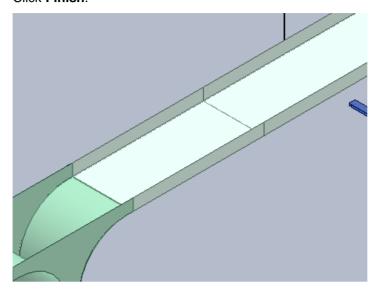
- 3. In the Split Mode box, select Single-Split.
- 4. To fine-tune the location of the split, click **Position** , and slide the split along the feature.



5. Click when it is at the location you want.

TIP Instead of using **Position**, you can adjust the section length, gap, and reference position boxes on the ribbon to adjust the location of the split.

6. Click Finish.



Insert a single cableway split

- 1. Click Insert Split 🕏.
- 2. Click a cableway straight feature.
- 3. In the Split Mode box, select Single-Split.
- 4. To fine-tune the location of the split, click **Position** and slide the split along the feature. Click when it is at the location you want.
- 5. Click Finish.

SECTION 16

Sequence Objects

Renames objects in the selected conduit, cable tray, or WBS item such that the names are in order, based on topology.

Sequence Objects Ribbon

Sets options for sequencing names in a conduit, cable tray, or WBS item.

Grouping/Sequencing Object Type

Select the grouping or object type that you want to sequence. You can select **Cableway**, **Conduit run**, or **WBS item**. This option defines the collection of target objects to be sequenced, and defines the boundaries of the sequencing.

Cancel

Resets the ribbon options.

Finish

Sets the object names in order using the options that you have set.

Target Object Type

Select what you want to re-sequence (rename) in the selected grouping.

Name Rule

Select the naming rule to use to rename the target objects.

Revision Control

Specify what to do with existing sequence number when you run the command again. Select **Retain existing numbers** to keep the sequence number on any objects that have one, but create a new sequence number for objects that do not have a sequence number. Select **Generate new numbers** to discard all sequence numbers for the selected object and generate new numbers for everything.

Start Sequence Id

Enter the sequence ID from which you want to begin the sequence. This option is available only when **Generate new numbers** is selected.

What do you want to do?

- Sequence a conduit (on page 247)
- Sequence a cable tray (on page 247)
- Sequence a WBS item (on page 247)

Sequence a conduit

- 1. Click Sequence Objects 3.
- 2. Select Conduit Run in the Grouping/Sequencing Object Type box.
- 3. Select one or more conduit runs in the Workspace Explorer or in the graphics view.
- 4. Select Conduit Part in the Target Object Type box.
- 5. Select the Name Rule and Revision Control.
- 6. Click Finish.

Sequence a cable tray

- 1. Click Sequence Objects 3.
- 2. Select Cableway in the Grouping/Sequencing Object Type box.
- 3. Select one or more cableways in the Workspace Explorer or in the graphics view.
- 4. Select Cabletray Part in the Target Object Type box.
- 5. Select the Name Rule and Revision Control option to use.
- 6. Click Finish.

Sequence a WBS item

- 1. Click Sequence Objects 3.
- 2. Select WBS Item in the Grouping/Sequencing Object Type box.
- 3. Select the WBS item in the Work Breakdown Structure tab.
- 4. Select the appropriate option in the **Target Object Type** box.
- 5. Select the Name Rule and Revision Control options to use.
- 6. Click Finish.

SECTION 17

Quick Route

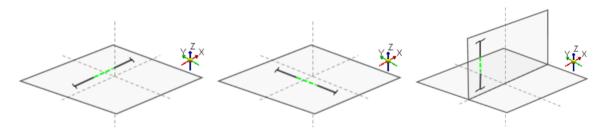
Joins two existing cable tray or conduit segments in the model. You can connect the cable tray or conduit segments by selecting an end feature, a nozzle, a straight feature, or a surface mounted component. The software displays all possible route paths between the selected *from* and *to* points.

Path Options

The software displays only the applicable path options based on the location and orientation of the selected end points in the model. The default option is **Join Direct**. The software remembers the last used path and sets it as the default option for the next operation. However, if the last used path is not applicable, the default option is reverted to **Join Direct**.

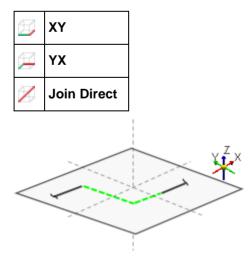
* IMPORTANT The software always computes the paths along the active co-ordinate axes.

Same axis: If both *from* and *to* end points lie along the same axis, then the software displays only **Join Direct** .



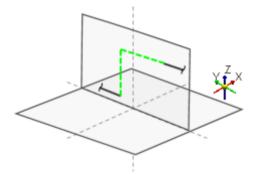
Same plane: If the *from* and *to* end points exist in the same plane, then the software displays the following options:

XY Plane:



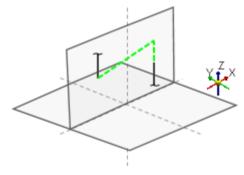
YZ Plane:





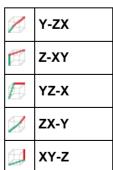
ZX Plane:

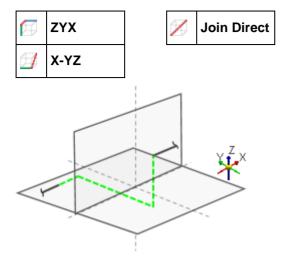




Different planes: If the *from* and *to* end points exist in different planes, then the software displays the following options:





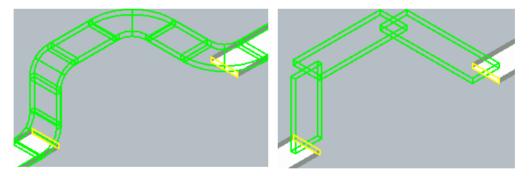


Minimum Distance Between End Points

Make sure to maintain a minimum distance between the two end points along each axis to avoid skews. The distance between the *from* and *to* end points should facilitate proper placement of the turn features. Insufficient distance might cause skews. The minimum distance is based on the dimensions of the selected route objects.

Fast Compute

In fast compute mode, the elbows or turns compute graphics are not rendered while in dynamic display. By default, the software does not use fast compute mode to dynamically display the compute graphics.



Fast Compute turned off

Fast Compute turned on

Navigating the Path Options

When you hover the mouse on a path option, the software dynamically displays the compute graphics for that path option. You can also press Tab or use the mouse scroll-wheel to navigate across the path options. Alternatively, you can also use the arrow keys to navigate. As you navigate, the software dynamically updates and displays the graphics.

Limitation

Quick Route does not support cable tray barrier and duct bank specifications. The **Number of Barriers** property on the **New Cableway** dialog box is not available when you are quick routing. However, you can use a specification without barriers to join two cable trays with barriers.

Quick Route Cableway Ribbon

Join From

Specifies the starting end point.

Join To

Specifies the terminating end point.

✓ Path Options

Displays all possible route path options to join the two end points. The first path option displayed on the menu is the default option.

★ IMPORTANT The software always computes the paths along the active co-ordinate axes.

- Join Direct Joins the from and to end points directly with a one-segment run, irrespective of the axes.
- XY Joins the from and to end points with the first segment run along the X-axis (E-axis), and then with the second segment along the Y-axis (N-axis).
- YX Joins the from and to end points with the first segment run along the Y-axis, and then with the second segment along the X-axis.
- YZ Joins the *from* and *to* end points with the first segment run along the Y-axis, and then with the second segment along the Z-axis (El-axis).
- ZY Joins the from and to end points with the first segment run along the Z-axis, and then with the second segment along the Y-axis.
- **XZ** Joins the *from* and *to* end points with the first segment run along the X-axis, and then with the second segment along the Z-axis.
- ZX Joins the from and to end points with the first segment run along the Z-axis, and then with the second segment along the X-axis.
- X-YZ Joins the from and to end points with the first segment run along the X-axis, and then with the second segment along the YZ plane.
- Y-ZX Joins the from and to end points with the first segment run along the Y-axis, and then with the second segment along the ZX plane.
- **Z-XY** Joins the *from* and *to* end points with the first segment run along the Z-axis, and then with the second segment along the XY plane.
- YZ-X Joins the *from* and *to* end points with the first segment run along the YZ plane, and then with the second segment along the X-axis.
- **ZX-Y** Joins the *from* and *to* end points with the first segment run along the ZX plane, and then with the second segment along the Y-axis.

- **XY-Z** Joins the *from* and *to* end points with the first segment run along the XY-axis, and then with the second segment along the Z-axis.
- **XYZ** Joins the *from* and *to* end points with the first segment run along the X-axis, the second segment run along the Y-axis, and the third segment run along the Z-axis.
- **XZY** Joins the *from* and *to* end points with the first segment run along the X-axis, the second segment run along the Z-axis, and the third segment run along the Y-axis.
- YZX Joins the *from* and *to* end points with the first segment run along the Y-axis, the second segment run along the Z-axis, and the third segment run along the X-axis.
- YXZ Joins the from and to end points with the first segment run along the Y-axis, the second segment run along the X-axis, and the third segment run along the Z-axis.
- **ZXY** Joins the *from* and *to* end points with the first segment run along the Z-axis, the second segment run along the X-axis, and the third segment run along the Y-axis.
- **ZYX** Joins the *from* and *to* end points with the first segment run along the Z-axis, the second segment run along the Y-axis, and the third segment run along the X-axis.

Finish

Places a run along the selected route path.

Run

Displays the existing cableways in the model along with the <New Cableway>, <New/Continue Run>, <Select Graphically>, and More options. Select the run to route.

- New Cableway> Displays the New Cableway dialog box. Use this option to create a new cableway. If a new cableway is created, all runs associated with the system parent selected on the New Cableway dialog box display in the list.
- New/Continue Run> Extends an existing cableway if you select the end feature of that cableway. If a run is continued, all runs associated with the system parent of the continued run display in the list. If you do not select an end feature, the New Cableway dialog box is displayed to create a cableway. For more information, see New Cableway Dialog Box (on page 61).
- <Select Graphically> Selects an existing cableway in a graphic view, or in the Workspace Explorer.
- More Displays the Select Cableway dialog box. Use this option to select a cableway
 that is associated with a different system parent. For more information, see Select
 Cableway Dialog Box (on page 70).

Fast Compute

Specifies whether or not the software must render complete compute graphics.

Quick Route Conduit Ribbon

Join From

Specifies the starting end point.

Join To

Specifies the terminating end point.

✓ Path Options

Displays all possible route path options to join the two end points. The first path option displayed on the menu is the default option.

- ★ IMPORTANT The software always computes the paths along the active co-ordinate axes.
- Join Direct Joins the from and to end points directly with a one-segment run, irrespective of the axes.
- XY Joins the from and to end points with the first segment run along the X-axis (E-axis), and then with the second segment along the Y-axis (N-axis).
- YX Joins the from and to end points with the first segment run along the Y-axis, and then with the second segment along the X-axis.
- YZ Joins the *from* and *to* end points with the first segment run along the Y-axis, and then with the second segment along the Z-axis (El-axis).
- ZY Joins the from and to end points with the first segment run along the Z-axis, and then with the second segment along the Y-axis.
- **XZ** Joins the *from* and *to* end points with the first segment run along the X-axis, and then with the second segment along the Z-axis.
- **ZX** Joins the *from* and *to* end points with the first segment run along the Z-axis, and then with the second segment along the X-axis.
- X-YZ Joins the from and to end points with the first segment run along the X-axis, and then with the second segment along the YZ plane.
- Y-ZX Joins the from and to end points with the first segment run along the Y-axis, and then with the second segment along the ZX plane.
- Z-XY Joins the from and to end points with the first segment run along the Z-axis, and then with the second segment along the XY plane.
- YZ-X Joins the *from* and *to* end points with the first segment run along the YZ plane, and then with the second segment along the X-axis.
- ZX-Y Joins the from and to end points with the first segment run along the ZX plane, and then with the second segment along the Y-axis.
- **XY-Z** Joins the *from* and *to* end points with the first segment run along the XY-axis, and then with the second segment along the Z-axis.
- **XYZ** Joins the *from* and *to* end points with the first segment run along the X-axis, the second segment run along the Y-axis, and the third segment run along the Z-axis.
- **XZY** Joins the *from* and *to* end points with the first segment run along the X-axis, the second segment run along the Z-axis, and the third segment run along the Y-axis.
- YZX Joins the *from* and *to* end points with the first segment run along the Y-axis, the second segment run along the Z-axis, and the third segment run along the X-axis.
- YXZ Joins the from and to end points with the first segment run along the Y-axis, the second segment run along the X-axis, and the third segment run along the Z-axis.

- ZXY Joins the from and to end points with the first segment run along the Z-axis, the second segment run along the X-axis, and the third segment run along the Y-axis.
- **ZYX** Joins the *from* and *to* end points with the first segment run along the Z-axis, the second segment run along the Y-axis, and the third segment run along the X-axis.

Finish

Places a run along the selected route path.

Run

Displays existing conduit runs along with the <New Conduit Run>, <New/Continue Run>, <Select Graphically> and More options.

- New Conduit Run> Displays the New Conduit Run dialog box. Use this option to create a new conduit run to route. If a new conduit run is created, all runs associated with the system parent selected on the New Conduit Run dialog box display in the list.
- New/Continue Run> Extends an existing conduit run if you select the end feature of that conduit run. If a run is continued, all runs associated with the system parent of the continued run display in the list. If you do not select an end feature, the New Conduit Run dialog box is displayed to create a conduit run. For more information, see New Conduit Run Dialog Box (on page 109).
- <Select Graphically> Selects an existing conduit run in a graphic view, or the Workspace Explorer.
- More Displays the Select Conduit dialog box. Use this option to select a conduit run
 that is associated with a different system parent. For more information, see Select
 Conduit Dialog Box (on page 112).

Fast Compute

Specifies whether or not the software must render complete compute graphics.

What do you want to do?

- Join two existing cableways (on page 255)
- Join two existing conduits (on page 260)
- Join two existing cableways at a branch point (on page 255)
- Join two existing conduits at a branch point (on page 260)

Join two existing cableways

- 1. Click Quick Route 1-1.
- 2. Select an end feature from which to extend the cableway.
- 3. Select a terminating end feature or a nozzle.

The software displays all possible path options based on the location of the selected features. You can navigate through the path options and view the dynamic compute graphics.

- 4. On the **Path Options** menu, select an option that you want. You can click the option or press Enter to confirm your selection.
 - **NOTE** By default, the software considers the highlighted option as your selection.
- 5. If necessary, select an appropriate run from the Run drop-down list, or proceed to Step 6.
 - Select <Select Graphically> to select an existing run in a graphic view or in the Workspace Explorer.
 - Select <New Cableway> to create a new cableway to route. For more information, see New Cableway Dialog Box (on page 61).
 - Select More... to select a cableway run that is associated with a different cable tray parent. For more information, see Select Cableway Dialog Box (on page 70).
- 6. Click Finish.

The software joins the two end points along the selected path.

- **WARNING** If the selected path results in skews, then the software prompts you with a warning message.
- a. Click **No** to undo the current path selection.
- b. Select another path option, and then click **Finish**.
- 7. Continue quick routing, or right-click to exit the command.

See Also

Join a cableway from a nozzle or port (on page 256)

Join two existing cableways at a branch point

- 1. Click Quick Route 1-1.
- 2. Select an end feature or a cable nozzle from which to extend the cable tray run.
- 3. Select a terminating straight feature or header run.
 - The software displays all possible path options based on the location of the selected features. You can navigate through the path options and view the dynamic compute graphics.
- 4. On the **Path Options** menu, select an option that you want. You can click the option or press Enter to confirm your selection.
 - **NOTE** By default, the software considers the highlighted option as your selection.
- 5. If necessary, select an appropriate run from the **Run** drop-down list, or proceed to Step 6.

- Select <Select Graphically> to select an existing run in a graphic view or in the Workspace Explorer.
- Select <New Cableway> to create a new cableway to route. For more information, see New Cableway Dialog Box (on page 61).
- Select More... to select a cableway run that is associated with a different cable tray parent. For more information, see Select Cableway Dialog Box (on page 70).
- 6. Click Finish.

The software joins the two end points along the selected path.

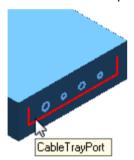
- **WARNING** If the selected path results in skews, then the software prompts you with a warning message.
- a. Click **No** to undo the current path selection.
- b. Select another path option, and then click Finish.
- 7. Continue quick routing, or right-click to exit the command.

See Also

Join cableway from a nozzle or port at a branch point (on page 258)

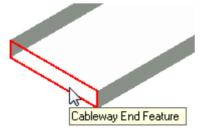
Join a cableway from a nozzle or port

- 1. Click Quick Route 1 on the vertical toolbar.
- 2. Select a nozzle or port from which to extend the cableway.



The software displays the **New Cableway** dialog box. For more information, see New Cableway Dialog Box (on page 61).

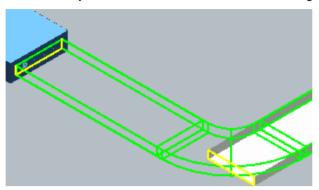
- 3. Select a cableway, and if necessary, specify required properties.
- 4. Select a terminating end feature or nozzle.



The software displays all possible path options based on the location of the selected features. You can navigate through the path options and view the dynamic compute

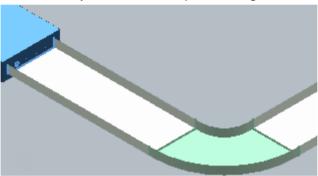
graphics.

- 5. On the **Path Options** menu, select an option that you want. You can click the option or press Enter to confirm your selection.
 - **NOTE** By default, the software considers the highlighted option as your selection.



6. Click Finish.

The software joins the two end points along the selected path.



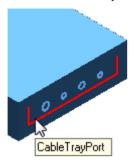
- WARNING If the selected path results in skews, then the software prompts you with a warning message.
- a. Click No to undo the current path selection.
- b. Select another path option, and then click Finish.
- 7. Continue quick routing, or right-click to exit the command.

See Also

Join two existing cableways (on page 255)

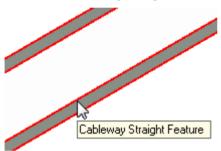
Join cableway from a nozzle or port at a branch point

- 1. Click Quick Route 1 on the vertical toolbar.
- 2. Select a cable tray nozzle from which to extend the cable tray.



The software displays the **New Cableway** dialog box. For more information, see New Cableway Dialog Box (on page 61).

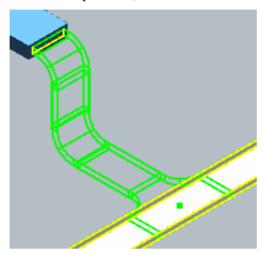
- 3. Select a cableway, and if necessary, specify required properties.
- 4. Select a terminating straight feature or header run.



The software displays all possible path options based on the location of the selected features. You can navigate through the path options and view the dynamic compute graphics.

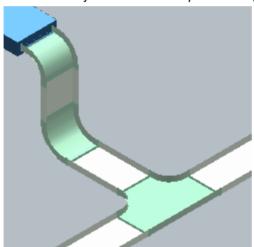
5. On the **Path Options** menu, select an option that you want. You can click the option or press Enter to confirm your selection.





6. Click Finish.

The software joins the two end points along the selected path.



- **WARNING** If the selected path results in skews, then the software prompts you with a warning message.
- a. Click **No** to undo the current path selection.
- b. Select another path option, and then click Finish.
- 7. Continue quick routing, or right-click to exit the command.

See Also

Join two existing cableways at a branch point (on page 255)

Join two existing conduits

- 1. Click Quick Route 1-1.
- 2. Select an end feature from which to extend the conduit.
- 3. Select a terminating end feature.

The software displays all possible path options based on the location of the selected features. You can navigate through the path options and view the dynamic compute graphics.

- 4. On the **Path Options** menu, select an option that you want. You can click on the option or press Enter to confirm your selection.
 - **NOTE** By default, the software considers the highlighted option as your selection.
- 5. If necessary, select an appropriate run from the Run drop-down list, or proceed to Step 6.
 - Select <Select Graphically> to select an existing run in a graphic view or in the Workspace Explorer.
 - Select <New Conduit Run> to create a new conduit run to route. For more information, see New Conduit Run Dialog Box (on page 109).
 - Select More... to select a conduit run that is associated with a different conduit parent.
 For more information, see Select Conduit Dialog Box (on page 112).
- 6. Click Finish.

The software joins the two end points along the selected path.

- **WARNING** If the selected path results in skews, then the software prompts you with a warning message.
- a. Click No to undo the current path selection.
- b. Select another path option, and then click **Finish**.
- 7. Continue quick routing, or right-click to exit the command.

See Also

Join a conduit from a nozzle or port (on page 261)

Join two existing conduits at a branch point

- Click Quick Route 1.
- 2. Select an end feature from which to extend the conduit run.
- 3. Select a terminating straight feature or header run.

The software displays all possible path options based on the location of the selected features. You can navigate through the path options and view the dynamic compute graphics.

- 4. On the **Path Options** menu, select an option that you want. You can click the option or press Enter to confirm your selection.
 - **NOTE** By default, the software considers the highlighted option as your selection.
- 5. If necessary, select an appropriate run from the **Run** drop-down list, or proceed to Step 6.

- Select <Select Graphically> to select an existing run in a graphic view or in the Workspace Explorer.
- Select <New Conduit Run> to create a new conduit run to route. For more information, see New Conduit Run Dialog Box (on page 109).
- Select **More...** to select a conduit run that is associated with a different conduit parent. For more information, see *Select Conduit Dialog Box* (on page 112).
- 6. Click Finish.

The software joins the two end points along the selected path.

- **WARNING** If the selected path results in skews, then the software prompts you with a warning message.
- a. Click **No** to undo the current path selection.
- b. Select another path option, and then click Finish.
- 7. Continue quick routing, or right-click to exit the command.

See Also

Join a conduit from a nozzle or port at a branch point (on page 263)

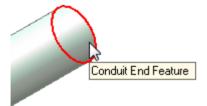
Join a conduit from a nozzle or port

- 1. Click Quick Route | on the vertical toolbar.
- 2. Select a conduit nozzle from which to extend the conduit.



The software displays the **New Conduit Run** dialog box. For more information, see New Conduit Run Dialog Box (on page 109).

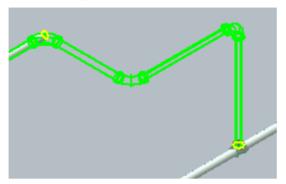
- 3. Select a conduit, and if necessary, specify required properties.
- 4. Select a terminating end feature or nozzle.



The software displays all possible path options based on the location of the selected features. You can navigate through the path options and view the dynamic compute graphics.

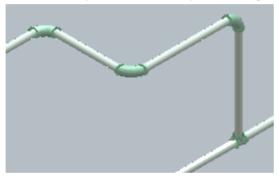
5. On the **Path Options** / menu, select an option that you want. You can click the option or press Enter to confirm your selection.

NOTE By default, the software considers the highlighted option as your selection.



6. Click Finish.

The software joins the two end points along the selected path.



- **9 WARNING** If the selected path results in skews, then the software prompts you with a warning message.
- a. Click **No** to undo the current path selection.
- b. Select another path option, and then click **Finish**.
- 7. Continue quick routing, or right-click to exit the command.

See Also

Join two existing conduits (on page 260)

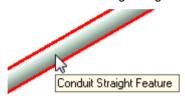
Join a conduit from a nozzle or port at a branch point

- 1. Click Quick Route 1 on the vertical toolbar.
- 2. Select a conduit nozzle from which to extend the conduit.



The software displays the **New Conduit Run** dialog box. For more information, see New Conduit Run Dialog Box (on page 109).

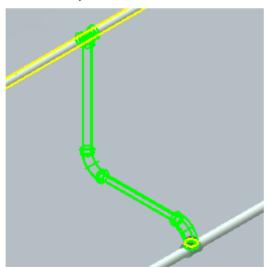
- 3. Select a conduit, and if necessary, specify required properties.
- 4. Select a terminating straight feature or header run.



The software displays all possible path options based on the location of the selected features. You can navigate through the path options and view the dynamic compute graphics.

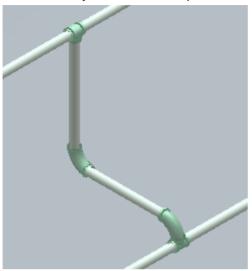
5. On the **Path Options** menu, select an option that you want. You can click the option or press Enter to confirm your selection.





6. Click Finish.

The software joins the two end points along the selected path.



9 WARNING If the selected path results in skews, then the software prompts you with a warning message.

- a. Click No to undo the current path selection.
- b. Select another path option, and then click **Finish**.
- 7. Continue quick routing, or right-click to exit the command.

See Also

Join two existing conduits at a branch point (on page 260)

SECTION 18

Disconnect Command

Tools > Utilities > Disconnect (CTRL+ALT+D)

Use this command to disconnect a section of route network, and modify its topology without disturbing the rest of the network. The software disconnects the selection at boundary connections, and deletes any mating parts and transitions at the boundaries. The software also removes all the relationships of the selection with the rest of the network.

We recommend that you reconnect objects after modifying the selection, to avoid topological errors.

You can disconnect the following objects:

- a cableway
- a conduit run
- a set of cableway features or conduit features
- a feature such as a turn feature, component type along leg feature, and straight feature.

Permission Group (PG), Approval Status, and Global Workshare Conditions

If you select route objects that belong to a permission group (PG) to which you have full control permission, the software disconnects the selected objects at boundary connections. You can also disconnect at a PG boundary connection if you do not have access to one side of the connection. But, you must have full control permissions to the objects that you select for disconnection.

If an object at the other end of the boundary connection is in a non-working approval state, the software generates a To-Do-List record for that object. Also, the software generates a To-Do-List record if the non-working object is in a different workshare location.

Limitations

- You cannot disconnect a branch feature, or an end feature.
- To disconnect a feature on a leg, you must have full control permission to that leg.
- If the selection includes equipment, the software does not disconnect the selection from the equipment nozzle.
- You cannot disconnect a surface-mounted component.
- You cannot disconnect cables.

What do you want to do?

- Disconnect a cableway (on page 266)
- Disconnect a cableway feature (on page 266)
- Disconnect a set of cableway features (on page 267)

- Disconnect a conduit run (on page 268)
- Disconnect a conduit feature (on page 268)
- Disconnect a set of conduit features (on page 269)

Disconnect a cableway

- 1. Click **Select** on the vertical toolbar.
- 2. Select Cableways in the Locate Filter.
- 3. Select a cable tray system from the Graphic View or the Workspace Explorer.
- 4. Click Tools > Utilities > Disconnect.

The software disconnects the selection, and prompts you to view the disconnection log.

5. Click Yes to view the log.

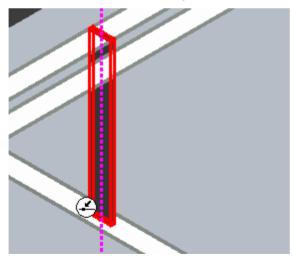
A log file displays the disconnection details.

■ NOTE The software disconnects the cableway from the rest of the network, and deletes any mating parts or transitions at the boundary connections. The software also removes the relationships between the cableway and the rest of the network.

Press CTRL+Z, or click **Edit** > **Undo Disconnect**. You can also use **Undo Disconnect** → on the main ribbon bar.

Disconnect a cableway feature

- 1. Click **Select** on the vertical toolbar.
- 2. In the Locate Filter, select Cableway Features.
- 3. Select a feature from the **Graphic View** or the **Workspace Explorer**.



NOTE You cannot select a branch feature or an end feature to disconnect.

4. Click Tools > Utilities > Disconnect.

The software disconnects the selection, and prompts you to view the disconnection log.

5. Click Yes to view the log.

A log file displays the disconnection details.

Total number of objects in the select set : 1

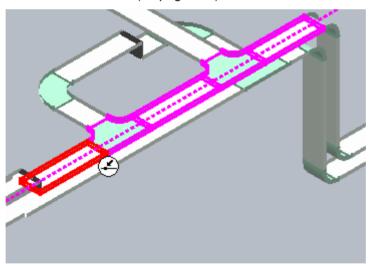
```
Total number of features selected: 1
List of Boundary features identified:

Cableway Straight Feature: {00013894-0000-0000-0008-B37E15532A04}
Successfully disconnected all boundaries.
```

- **NOTE** The software disconnects the cableway feature from the rest of the network, and deletes any mating parts or transitions at the boundary connections. The software also removes the relationships between the cableway feature and the rest of the network.
- Press CTRL+Z, or click **Edit** > **Undo Disconnect**. You can also use **Undo Disconnect** on the main ribbon bar.

Disconnect a set of cableway features

- 1. Click **Select** on the vertical toolbar.
- 2. In the Locate Filter, select Cableway Features.
- 3. Select the features from the **Graphic View** or the **Workspace Explorer**.
 - TIP Use SHIFT+SELECT to select multiple features. You can also use the *Route Selection Commands* (on page 133).



4. Click Tools > Utilities > Disconnect.

The software disconnects the selection, and prompts you to view the disconnection log.

5. Click Yes to view the log.

A log file displays the disconnection details.

```
Total number of objects in the select set : 5

Total number of features selected : 5

List of Boundary features identified :

Cableway Straight Feature: {00013894-0000-0000-8227-9E8415532E04}
Cableway Straight Feature: {00013894-0000-0000-A368-9C8016534404}
Cableway Along Leg Feature: {00013891-0000-0000-AC23-9E8415532E04}
Cableway Along Leg Feature: {00013891-0000-0000-8127-9E8415532E04}
Successfully disconnected all boundaries.
```

■ NOTE The software disconnects the selection from the rest of the network, and deletes any mating parts or transitions at the boundary connections. The software also removes the relationships between the selection and the rest of the network.

Press CTRL+Z, or click **Edit** > **Undo Disconnect**. You can also use **Undo Disconnect** → on the main ribbon bar.

Disconnect a conduit run

- 1. Click **Select** on the vertical toolbar.
- 2. Select Conduit Runs in the Locate Filter.
- 3. Select a conduit run from the **Graphic View** or the **Workspace Explorer**.
- 4. Click Tools > Utilities > Disconnect.

The software disconnects the selection, and prompts you to view the disconnection log.

5. Click Yes to view the log.

A log file displays the disconnection details.

■ NOTE The software disconnects the conduit run from the rest of the network, and deletes any mating parts or transitions at the boundary connections. The software also removes the relationships between the conduit run and the rest of the network.

Press CTRL+Z, or click **Edit** > **Undo Disconnect**. You can also use **Undo Disconnect** on the main ribbon bar.

Disconnect a conduit feature

- 1. Click **Select** on the vertical toolbar.
- 2. In the Locate Filter, select Conduit Features.
- 3. Select a feature from the **Graphic View** or the **Workspace Explorer**.
 - NOTE You cannot select a branch feature or an end feature to disconnect.
- 4. Click Tools > Utilities > Disconnect.

The software disconnects the selection, and prompts you to view the disconnection log.

5. Click Yes to view the log.

A log file displays the disconnection details.

■ NOTE The software disconnects the feature from the rest of the network, and deletes any mating parts or transitions at the boundary connections. The software also removes the relationships between the feature and the rest of the network.

Press CTRL+Z, or click **Edit** > **Undo Disconnect**. You can also use **Undo Disconnect** on the main ribbon bar.

Disconnect a set of conduit features

- 1. Click **Select** on the vertical toolbar.
- 2. In the Locate Filter, select Conduit Features.
- 3. Select the features from the **Graphic View** or the **Workspace Explorer**.
 - TIP Use SHIFT+SELECT to select multiple features. You can also use the *Route Selection Commands* (on page 133).
- 4. Click Tools > Utilities > Disconnect.

The software disconnects the selection, and prompts you to view the disconnection log.

5. Click Yes to view the log.

A log file displays the disconnection details.

■ NOTE The software disconnects the selection from the rest of the network, and deletes any mating parts or transitions at the boundary connections. The software also removes the relationships between the selection and the rest of the network.

Press CTRL+Z, or click **Edit** > **Undo Disconnect**. You can also use **Undo Disconnect** on the main ribbon bar.

SECTION 19

View Cable Schedule

Displays retrieved cable schedules. You must retrieve cable schedules to view or create cables while in the Electrical task within Smart 3D. You can then update the cables. Use the **SmartPlant > Retrieve** command to retrieve electrical documents. This command is only available if you registered the active model with SmartPlant Foundation in the Project Management task. For more information on how to retrieve documents, see Retrieve Documents.

See Also

Cable Schedule Documents Dialog Box (on page 272)

Viewing Retrieved Cables

The **SmartPlant > View Cable Schedule** command displays retrieved cable schedule documents into the model. The **View Cable Schedule** command is available only in Electrical task.

The retrieved cable schedule documents contain cable design basis data. You can select the retrieved cables, and create them in the 3D model using the cable schedule commands. All the processed cables will be created under a specified electrical system in the Workspace Explorer.

Before viewing the cable schedule, select an appropriate electrical system in the **Workspace Explorer** to create cables under that system. Smart 3D creates the cables with the same name as in the cable schedule document. If you do not select an electrical system, then Smart 3D creates a new system with the same name as the cable schedule document, and then creates cables under the new system.

Smart 3D searches the terminal equipment defined in the cable schedule, and automatically selects the equipment to which the new cable is connected. If the equipment is not in the model, then the cable is not created in the model.

You can then select the cables from the Workspace Explorer, and modify as necessary.

Retrieve Electrical Documents

Update Retrieved Cables

View Cable Schedule

Blue

Red

Black

Green

Cables not in 3D

Data mismatch/
model

Deleted/Ignored cables

Validate and Process

Publish Documents

NOTE Any modifications made to the cables are reflected in the cable schedule only when you refresh the corresponding cables list.

See Also

Cable Schedule Documents Dialog Box (on page 272) Cable Schedule Dialog Box (on page 273) Import cables (on page 271)

Import cables

★ IMPORTANT

- You must retrieve at least one cable schedule to view the cable schedule. Use the SmartPlant > Retrieve command. This command is available only if you have registered the active model with SmartPlant Foundation in the Project Management. For more information on how to retrieve documents, see in the Common User's Guide.
- Before viewing the cable schedule, select an appropriate electrical system in the Workspace Explorer to create cables. Smart 3D creates the cables with the same name as in the cable schedule document. If you do not select an electrical system, then Smart 3D creates a new system with the same name as the cable schedule document, and then creates cables under the new system.
- Set the Active Permission Group to Electrical and assign the objects that you place in the model to the Active Permission Group.
- 1. Click SmartPlant > View Cable Schedule.
- 2. On the Cable Schedule Documents dialog box, select a cable schedule, and click Open.
- 3. On the **Cable Schedule** dialog box, set the **Include up-to-date cables** option as necessary.

- TIP Include up-to-date cables option allows you to hide the cables that are already processed and up-to-date.
- 4. Select cables in the grid.
 - TIP You can click Select All, or use the CTRL or SHIFT keys to select multiple cables.
- Click Validate to verify if the Part Number, From Device and To Device exist in 3D model data.

The selected cable is validated, and its validation status is updated. Any missing data is highlighted in bold text.

6. Select the validated cable, and then click **Process**.

NOTE For a cable to successfully process, its design basis data displayed on the list must match with corresponding 3D model data.

TIPS

- When you select a cable on the Cable Schedule dialog box, the corresponding cable is automatically selected in the Workspace Explorer.
- You can Autoroute ⁽¹⁾, or Delete ⁽²⁾ a processed cable without exiting the Cable Schedule dialog box.
- Click View Cable Schedule Documents to return to the cable schedule documents list.

See Also

Cable Schedule Documents Dialog Box (on page 272) Cable Schedule Dialog Box (on page 273)

Cable Schedule Documents Dialog Box

Displays a list of retrieved cable schedules and their associated properties. Select a schedule, and then click **Open** to view the cables.

Name

Displays the name of the document.

Document Type

Displays the type of document.

Document Title

Displays the title of the document.

See Also

Cable Schedule Dialog Box (on page 273)

Cable Schedule Dialog Box

Displays a list of cables in a grid format.

View Cable Schedule Documents

Returns you to the **Cable Schedule Documents** dialog box. You can also press BACKSPACE.

Refresh

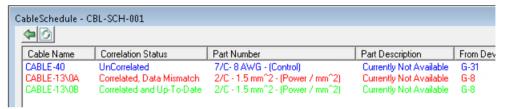
Updates the cable schedule. After modifying the cables in Smart 3D, click **Refresh** to reflect the changes in the cable schedule.

Cable Name

Displays the name of the cable as defined in the design basis data.

Correlation Status

Displays the correlations status of the cable design basis data with corresponding 3D model data. The colors identify the correlation status of each cable in the model and the design basis object that corresponds to it.



Default Color	Status	Description
Correlated and up-to-date		The cable in the design basis has a match in the 3D model without any discrepancies in the cable data, and the data is up-to-date.
•	Correlated, Data Mismatch	The cable in the design basis has a match in the 3D model. However, there are discrepancies in the cable data.
	Uncorrelated	The cable in the design basis does not exist in the 3D model, or is unknown.
	Ignored	The cable metadata in the design basis is ignored.

Part Number

Displays the part number for the cable as defined in the design basis data.

Part Description

Displays the short description of the cable part as defined in the design basis data.

From Device

Displays the cable originating equipment code as defined in the design basis data.

To Device

Displays the cable terminating equipment code as defined in the design basis data.

Signal Type

Displays the type of signal the cable will carry as defined in the design basis data.

Validation Status

Displays the validation status of the selected cable. The following are the available validation statuses:

Not Validated - Specifies that the cable is not validated. This is the default status.

Invalid - Specifies that the cable is missing a **Part Number**, **From Device**, or **To Device** data in 3D model. The missing value is highlighted in bold.

Valid - Specifies that the design basis cable has Part Number, From Device, and To Device data in 3D model.

Validate

Verifies if the selected cable has **Part Number**, **From Device**, and **To Device** data available in the 3D model.

Process

Imports or updates the selected cables. When you process the cables, the software creates the cables in 3D model and correlates with corresponding cable design basis data.

View Log

Displays a **CreateEFCables.log** file. The file contains information about successfully processed cables, and the cables that could not be processed due to data inconsistencies.

Include up-to-date cables

Appends Correlated and up-to-date cables to the current cable schedule.

Select All

Selects all the cables in the list.

Select Valid Cables

Selects all uncorrelated valid cables in the list.

See Also

Import cables (on page 271)
Cable Schedule Documents Dialog Box (on page 272)

APPENDIX A

Appendix: Property Dialog Boxes

The software displays some common property tabs on the **Properties** dialog boxes for all electrical objects. Instead of repeatedly listing the common tabs with each electrical object **Properties** dialog box, they are documented here for easy reference.

Configuration Tab (on page 275) Connections Tab (on page 277) Definition Tab (on page 277) Notes Tab (on page 277) Relationship Tab (on page 278) Occurrence Tab (on page 279)

In This Appendix

Configuration Tab	275
Connections Tab	277
Definition Tab	277
Notes Tab	277
Relationship Tab	278
Occurrence Tab	279
Select System Dialog Box	283

Configuration Tab

Displays the creation, modification, and status information about an object.

NOTE You cannot define the filters using the **Configuration** tab.

Plant

Displays the name of the model. You cannot change this value.

Permission Group

Specifies the permission group to which the object belongs. You can select another permission group, if needed. Permission groups are created in Project Management.

Transfer

Reassigns ownership of the selected model objects from their current permission group to another satellite or host permission group. This option is only available if the active model or project is replicated in a workshare configuration. The option is not available if all of the objects in the select set already belong to another location and are non-transferable. For more information, see *Transfer Ownership Dialog Box* in the *Common User's Guide*.

NOTE The Transfer option does not apply to the filters and surface style rules.

Approval State

Specifies the current status of the selected object or filter. The display depends on your access level. You might be unable to change the status of the object. The list is defined by the ApprovalStatus codelist.

NOTE You can only edit or manipulate an object with a status of Working.

Status

Specifies the location of the object in the workflow process. Changing this property sets the **Approval State**. The list is controlled by the ApprovalReason codelist in the ApprovalReason.xls file. You must bulkload this file. For more information, see *ApprovalReason* in the *Reference Data Guide*.

Date Created

Specifies the creation date of the object.

Created by

Specifies the name of the person who created the object.

Date Last Modified

Specifies the date when the object was last modified.

Last Modified by

Specifies the name of the person who last modified the object.

Transfer Ownership Dialog Box

Allows you to specify a new location and permission group for the selected model objects.

Current location

Displays the name of the location with which the current permission group is associated. All of the objects in the select set must belong to the same location.

Current permission group

Displays the name of the permission group with which the selected objects are currently associated. If all of the objects in the select set do not belong to the same permission group, this box appears blank.

New location

Specifies the name of the location to which you want to assign the objects. In a global workshare configuration, this box lists all the locations in which you have write access to one or more permission groups. The selection in this box filters the entries in the **New permission group** box.

New permission group

Specifies the new permission group to which to assign the selected objects. If you specify a value in the **New location** box, this list displays all permission groups to which you have write access in the selected location. If you do not specify a value in the **New location** box, this list includes all permission groups to which you have write access in all locations except the current location. This box is blank if you do not have write access to any permission groups at any locations other than the current one.

NOTE We strongly recommend that administrators follow naming convention rules that include the location as a prefix in the permission group name.

Connections Tab

Displays the connection information for the object, the properties and their values, as defined in the reference data. For more information about the information defined in the reference data, see the *Electrical Reference Data Guide* available from the **Help > Printable Guides** command in the software.

Connector

Select the connector for which you want to view properties.

Property

Displays the name of the property as defined in the reference data.

Value

Displays the value of the corresponding property.

See Also

Edit Properties (on page 157)

Definition Tab

The **Definition** tab displays the object properties as they are defined in the reference data. The property name appears on the left side of the grid and the corresponding property value appears on the right side of the grid. If you selected more than one object and then selected the **Properties** command, only the common properties between the selected objects display.

The properties that appear depend on what you defined in the reference data. For more information on the properties, refer to the *Electrical Reference Data Guide* available from the **Help > Printable Guides** command in the software.

See Also

Edit Properties (on page 157)

Notes Tab

Creates and edits user-definable text placed by the designer on an object in the model. The notes provide special instructions related to the object for the fabricator and are available in downstream tasks. For example, the notes appear in two-dimensional drawings and within design review sessions.

NOTE Only one note of a given kind from a given object can be shown on a drawing. For example, if there are two fabrication notes on a piping part, then only one of the notes shows on the drawing. It is important to know about and to consider this situation when defining notes on an object in the modeling phase. For example, you can display one Fabrication note and one Installation note by defining two separate labels for the two kinds of notes.

Key point

Specifies the key point on the object to which you want to add a note.

Notes at this location, listed by name

Lists all notes for the selected key point on the object.

Date

Displays the date that the note was created. The system automatically supplies the date.

Time

Displays the time that the note was created. The system automatically supplies the time.

Purpose of note

Specifies the purpose of the note.

Author

Displays the login name of the person who created the note. The system automatically supplies this information. You cannot change this information.

Note text

Defines the note text. The software does not limit the length of the note text.

Show dimension

Indicates that the note generates a dimension.

If you are displaying the properties for a Support component, then a dimension can be included for the component in the Support drawings, if you select the **Show dimension** option. The note must be associated with one of the key points for the Support component. It is recommended that you set the **Purpose of note** as **Fabrication**, but this is not a requirement. The note **Name** and **Note text** are not used when you select this option.

New Note

Creates a new note on the object.

Standard Note

Displays a list of standard notes from which you can select. This feature is not available in this version.

Highlight Note

Highlights the note in the graphic view so that you can easily find the note and the object to which it is related. This feature is not available in this version.

Delete Note

Deletes the currently displayed note.

Relationship Tab

Displays all objects related to the selected object for which you are viewing properties. For example, if you are viewing the properties of a pipe run, the related pipeline, features, parts, associated control points, hangers or supports, and equipment display on this tab. All WBS assignments, including project relationships, appear on this tab.

Additional examples for marine relationships are as follows:

- For plate and profile system properties, the related bounded objects, bounding objects, and connections are shown.
- For plate and profile system part properties, parent systems are shown.

- For assembly connection properties, all connected objects are shown.
- For the properties of a frame connection on a member, supported, supporting, and auxiliary supporting parts are shown.
- For split connection properties, the parent and auxiliary supporting parts are shown.

Name

Specifies the name of the object.

Type

Specifies the type of object. To change the options on the list, edit the **Weld Type** select list in Catalog.

Go To

Displays the properties of the selected object.

Occurrence Tab

Displays instance-specific information about the object. For more information about occurrences defined in the reference data, see the *Electrical Reference Data Guide* available from the **Help > Printable Guides** command in the software.

Category

Select the properties that you want to view for the object. Object properties are divided into two categories: Standard, and Weight and CG.

Insert Next Cable

Resets the property values to default values except **System**, **Name Rule** and **Signal Type**. This command is available only after you successfully insert a cable by clicking **Apply**.

Standard

Displays all the occurrence properties for the part as defined in the reference data. If the table is blank, the object for which you are viewing properties does not have any occurrence properties defined for it in the reference data. Not all standard category properties defined here are available on every part type. For more information about occurrences defined in the reference data, see the *Electrical Reference Data Guide*.

System

Select the system to which you want the cable to belong. The last system that you selected is the default. Select **More** to display all systems. You can create a new cable in the Systems and Specifications task.

Name

Displays the occurrence name of the object.

Name Rule

Displays how the object was named. If set to **Default Name Rule**, the software names the object using the default naming rule. If set to **User Defined**, then you need to specify the object name manually.

Parallel Cables

Specifies the number of parallel cables the conduit\cableway will contain.

Operating Voltage

Specifies the operating voltage of the cable.

Signal Type

Specifies the type of application of the cable, such as **Communication**, **Control**, **Data**, **Fire Alarm**, **Lighting**, **Multi-Conductor Power**, **Power**, and **Signal**. The default option is **Undefined**.

Part Number

Specifies the part number for the cable.

Cable Type

Displays the name of cable type corresponding to the selected part number, as defined in the reference data.

Cable Diameter

Displays the diameter of the cable corresponding to the selected part number, as defined in the reference data.

Originating Device

Specifies the device type from which the cable originates. You can browse to select equipment, piping components, piping custom specialties and instruments as the originating devices.

Receptacle (Equipment 1)

Specifies the receptacle equipment type. This property is available depending on the originating device.

Terminal (Equipment 1)

Specifies the terminal equipment type. This property is available depending on the originating device.

Connector (Equipment 1)

Specifies the type of connector. This property is available depending on the originating device.

Backshell (Equipment 1)

Specifies the type of backshell. This property is available depending on the originating device.

Terminating Device

Specifies the device type at which the cable terminates. You can browse to select equipment, piping components, piping custom specialties and instruments as the terminating devices.

Receptacle (Equipment 2)

Specifies the receptacle equipment type. This property is available depending on the terminating device.

Terminal (Equipment 2)

Specifies the terminal equipment type. This property is available depending on the terminating device.

Connector (Equipment 2)

Specifies the type of connector. This property is available depending on the terminating device.

Backshell (Equipment 2)

Specifies the type of backshell. This property is available depending on the terminating device.

Cableway Length

Specifies the length of the cableway\conduit.

Tail Length At Origin

Specifies the tail length of the cable at the origin.

Tail Length At Destination

Specifies the tail length of the cable at the destination.

Estimated Total length

Displays the estimated length of the cable. This value is equal to the sum of **Cableway Length**, **Tail Length at Origin**, and **Tail Length at Destination**. The default value is 0.

Cut Cable Length

Displays the total cable length. This value is equal to the sum of **Spare Cable Length at Origin**, **Spare Cable Length at Destination**, and **Estimated Total Length**. The default value is 0.

Spare Cable Length at Origin

Specifies the length of the cable spared at the originating device. The default value is 0.

Spare Cable Length at Destination

Specifies the length of the cable spared at the terminating device. The default value is 0.

■ NOTES

- After migrating the models, the old Spare Cable length is assigned to Spare Cable Length at Origin. If the old Spare Cable value is empty, then this property is set to its default value.
- When you delete the routed cable, the Spare Cable Length at Origin and Spare Cable Length at Destination values for that cable are retained.
- You need to configure and update the reports after the migration.

Conduit Specification

Displays the specification of the conduit.

Route Status

Specifies the route status. The default value is **Undefined**. The list is defined by the CableRouteStatus codelist.

Correlation Basis

Displays if the cable is required to be correlated to a P&ID cable. Select **Correlate object** if the cable has a correlating cable in a P&ID. Select **No correlation** is required if the cable does not have a correlating cable in a P&ID.

Correlation Status

Displays whether the cable has been correlated to a cable in a P&ID.

Correlation Approval Status

Displays if the component is approved with discrepancies in the three-dimensional data compared with design basis data. Select **Topology mismatch approved** if the topology mismatch of components can be ignored. Select **Data and Topology mismatches approved** if the data and topology mismatches of components can be ignored. Select **None** if you do not want to approve a mismatch.

Weight and CG

Displays the center-of-gravity and the weight of the selected object. The software includes the insulation weight in the calculated weight. If you key-in the weight yourself, you must include the insulation weight in the weight value that you type. The center-of-gravity locations are displayed in global system coordinates along the X-, Y-, and Z-axes.

Dry Weight

Displays the dry weight of the object.

Wet Weight

Displays the wet weight of the object.

Dry CG X

Displays the X-axis location of the dry center-of- gravity.

Dry CG Y

Displays the Y-axis location of the dry center-of- gravity.

Dry CG Z

Displays the Z-axis location of the dry center-of- gravity.

Wet CG X

Displays the X-axis location of the wet center-of- gravity.

Wet CG Y

Displays the Y-axis location of the wet center-of- gravity.

Wet CG Z

Displays the Z-axis location of the wet center-of- gravity.

See Also

Edit Properties (on page 157)

Select System Dialog Box

Displays the systems applicable to the current command. For example, if you are routing conduit, the conduit and generic systems are displayed on this dialog box.

Look in

Specify where you want to look for the system. Select **Workspace** to look for the system in your defined workspace only. Select **Database** to look for the system in the entire Model database.

APPENDIX B

Appendix: Moving at Boundary Connections

If you move a section of a cable tray network, the software modifies and disconnects the cable tray network as necessary to maintain the cable tray design intent. Also, the software lengthens or shortens the cable tray as needed to make a connection.

See Also

Connecting cable trays or cableways using Move (on page 284) Disconnecting cable trays using Move (on page 290)

Connecting cable trays or cableways using Move

★IMPORTANT To connect two cable trays or cableways using Move �:

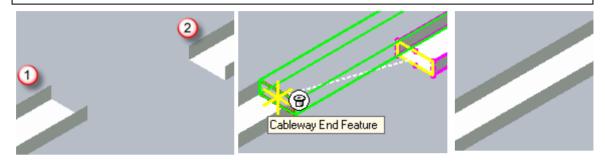


- For inline connections, the two cable tray ends or cableway ends must be collinear to each other.
- For branch connections, the header and branch runs must be orthogonal to each other.
- There should be sufficient space at the connection to accommodate the connecting part. If the space is not sufficient, the software does not make a connection and displays a message suggesting that you manually to connect the cable trays.
- The software consumes the first available straight feature of the moved cable tray to accommodate the connection thickness, such as a mating part.
- In a partial move, if the connection results in an overlap the software connects the two ends with a To Do Record to maintain the connectivity.
- If there is no space to accommodate the mating part, the software does not connect the two ends and displays a message suggesting that you to connect the ends manually.

Inline Connection

No.	Route Object	Approval Status	Permission Group Access
1	Cable tray A	Working	Full control/ Write
2	Cable tray B	Working	Full control/ Write

Result: The software connects the cable trays A and B, but does not merge the cable trays into a single cable tray.



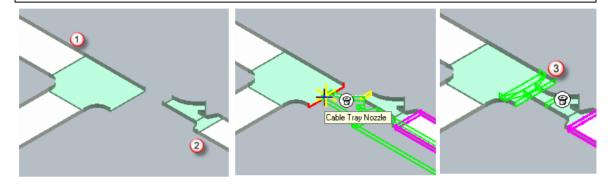
No.	Route Object	Approval Status	Permission Group Access
1	Cable tray A	Working	Full control/ Write
2	Cable tray B	Working	Full control/ Write
3	Mating part associated with cable tray B		

Result: The software connects the two cable trays with a mating part. Reduction in cable tray B straight length = mating part length.



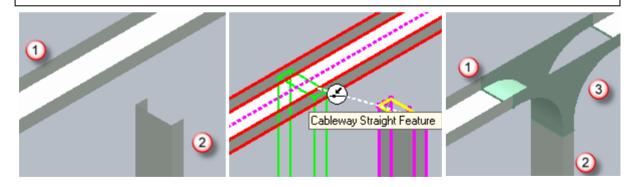
No.	Route Object	Approval Status	Permission Group Access
1	Cable tray A	Working	Full control/ Write
2	Cable tray B	Working	Full control/ Write
3	Connection overlap		

Result: The software does not connect the cable trays because there was not enough space to accommodate the transition part. The software displays a message suggesting that you to connect the trays manually.



Branch Connection

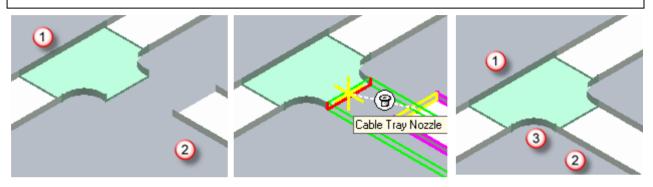
No.	Route Object	Approval Status	Permission Group Access
1	Header run	Working	Full control/ Write
2	Branch run	Working	Full control/ Write
3	Vertical tee connection associated with the header		
Result: The software connects the header and branch runs using a system-generated vertical tea			



Appendix: Moving at Boundary Connections

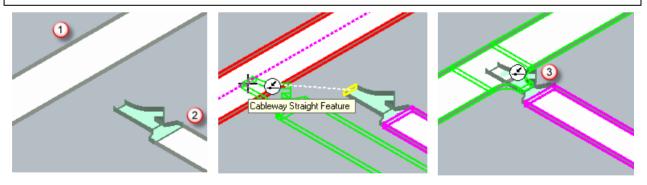
No.	Route Object	Approval Status	Permission Group Access
1	Header run	Working	Full control/ Write
2	Branch run	Working	Full control/ Write
3	Horizontal tee connection associated with the header		

Result: The software connects the header and branch runs at the tee end feature.



No.	Route Object	Approval Status	Permission Group Access
1	Header run	Working	Full control/ Write
2	Branch run	Working	Full control/ Write
3	Connection overlap		

Result: The software does not connect the cable trays because there was not enough space to accommodate the transition part. The software displays a message suggesting that you connect the trays manually.

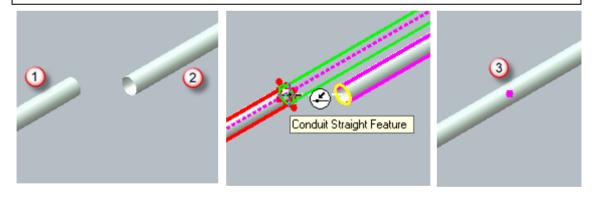


Connecting conduit runs using Move

- ★IMPORTANT To connect two conduit runs using Move �:
- For inline connections, the two conduit ends must be collinear to each other.
- For branch connections, the header and branch runs must be orthogonal to each other.
- There should be sufficient space at the connection to accommodate the connecting part. If the space is not sufficient, the software does not make a connection and displays a message suggesting that you connect the conduit runs manually.
- The software consumes the first available straight feature of the moved conduit run to accommodate the connection thickness, such as a mating part.
- In a partial move, if the connection results in an overlap the software connects the two ends with a To Do Record to maintain the connectivity.
- If there is no space to accommodate mating part, the software does not connect the two ends and displays a message suggesting that you to connect the ends manually.

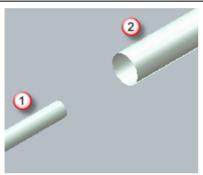
Inline Connection

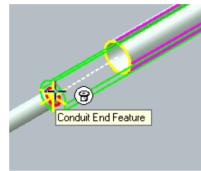
No.	Route Object	Approval Status	Permission Group Access
1	Conduit run A	Working	Full control/ Write
2	Conduit run B	Working	Full control/ Write
3	3 Connection		
Result: The software connects the conduits A and B.			

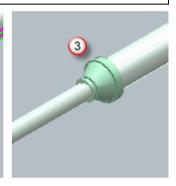


No.	Route Object	Approval Status	Permission Group Access
1	Conduit run A	Working	Full control/ Write
2	Conduit run B	Working	Full control/ Write
3	Transition mating part connecting the conduits		

Result: The software connects the conduits A and B using a mating reducer. Reduction in conduit B length = connection thickness.

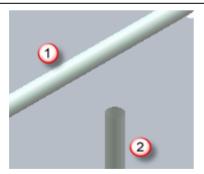


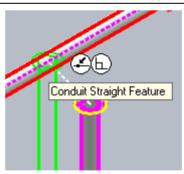




Branch Connections

No.	Route Object	Approval Status	Permission Group Access	
1	Header run	Working	Full control/ Write	
2	Branch run	Working	Full control/ Write	
3	3 Horizontal tee connection associated with the header			
Result: The software connects the header and branch runs at the tee end feature.				

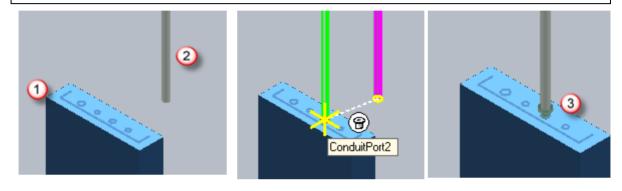






Equipment Connection

No.	Route Object	Approval Status	Permission Group Access	
1	Conduit run	Working	Full control/ Write	
2	Equipment	Working	Full control/ Write	
3	3 Coupling connection			
Result: The software connects the conduit run and equipment at the conduit port on the equipment.				



Disconnecting cable trays using Move

When you move a cable tray run, the software disconnects all the associated boundary connections. If you move a header run that is connected to an open-ended branch run, the branch run follows the header run. If the branch run is not open-ended, the software disconnects the branch from the header.

If a selection is restricted by adjacent features, use **Disconnect** to disconnect that selection, and then use **Move** * to move the selection without disturbing the rest of the network. For more information, see Disconnect Command (on page 265).

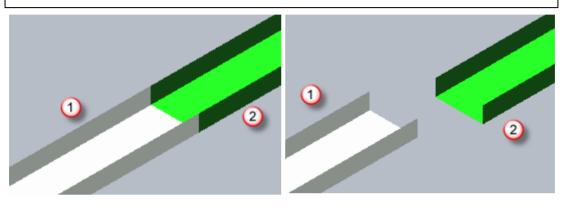
See Also

Cable tray to cable tray connections (on page 291) Header to branch connections (on page 293)

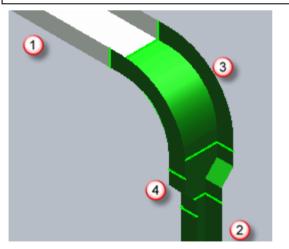
Cable tray to cable tray connections

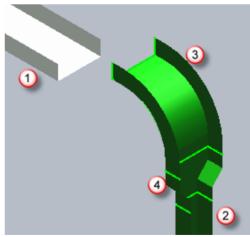
No.	Route Object	Approval Status	Permission Group Access
1	Cable Tray A	Working	Full control/ Write
2	Cable Tray B	Non-working	-

Result: The software disconnects cable tray A. You can reconnect using Move 💠.

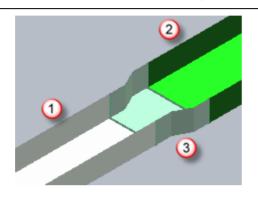


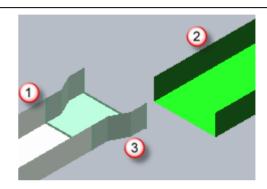
No.	Route Object	Approval Status	Permission Group Access	
1	Cable tray A	Working	Full control/ Write	
2	Cable tray B	Non-working	-	
3	Turn feature associated with cable tray A			
4 Reducing transition associated with cable turn B				
Result: The software disconnects cable tray A. You can reconnect using Move .				



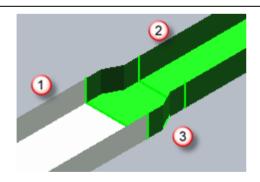


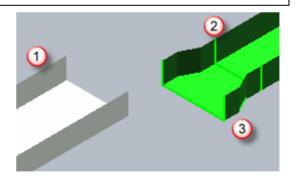
No.	Route Object	Approval Status	Permission Group Access
1	Cable tray A	Working	Full control/ Write
2	Cable tray B	Non-working	-
Reducer associated with cable tray A			
Result: The software disconnects cable tray A. You can reconnect using Move .			





No.	Route Object	Approval Status	Permission Group Access
1	Cable tray B	Working	Full control/ Write
2	Cable tray B	Non-working	-
3 Reducer associated with cable tray B			
Result: The software disconnects cable tray A. You can reconnect using Move .			

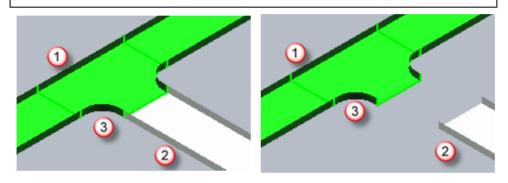




Header to branch connections

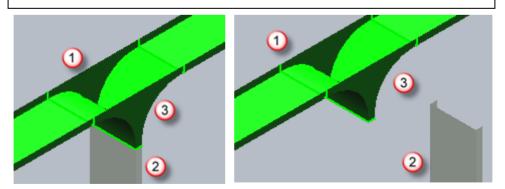
No.	Route Object	Approval Status	Permission Group Access
1	Header run	Non-working	-
2	Branch run	Working	Full control/ Write
3	Tee associated with header run		

Result: The software disconnects the branch run and header run, but does not delete the tee. You can reconnect the branch run using **Move**.



No.	Route Object	Approval Status	Permission Group Access
1	Branch run	Working	Full control/ Write
2	Header run	Non-working	-
3	Vertical tee associated with header run		

Result: The software disconnects the branch run and header run, but does not delete the tee. You can reconnect the branch run using **Move**.



Disconnecting conduits using Move

When you move a conduit, the software disconnects all the associated boundary connections. If you move a header run that is connected to a open-ended branch run, the branch run follows the header run. If the branch run is not open-ended, the software disconnects the branch from the header.

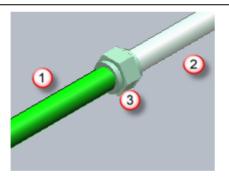
If a selection is restricted by adjacent features, use the **Disconnect** command to disconnect that selection, and then use **Move** to move the selection without disturbing the rest of the network. For more information, see *Disconnect Command* (on page 265).

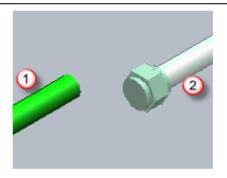
See Also

Conduit run to conduit run connections (on page 294) Conduit header to branch connections (on page 295)

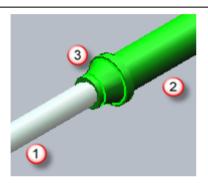
Conduit run to conduit run connections

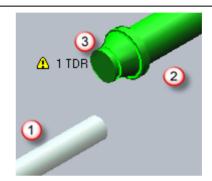
No.	Route Object	Approval Status	Permission Group Access	
1	Conduit run B	Non-working	-	
2	Conduit run A	Working	Full control/ Write	
3	Coupling associated with conduit run A			
Resu	Result: The software disconnects conduit run A. You can reconnect using Move			





No.	Route Object	Approval Status	Permission Group Access	
1	Conduit run A	Working	Full control/ Write	
2	Conduit run B	Non-working	-	
3	3 Transition associated with conduit run B			
Result: The software disconnects conduit run A. You can reconnect using Move				

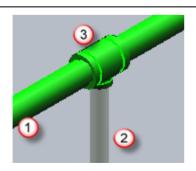


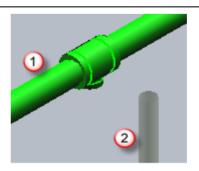


Conduit header to branch connections

No.	Route Object	Approval Status	Permission Group Access
1	Header run	Non-working	-
2	Branch run	Working	Full control/ Write
3	Tee associated with header run		

 $\textbf{Result::} \ The \ software \ disconnects \ the \ branch \ run \ and \ header \ run, \ and \ does \ not \ delete \ the \ tee. \ You \ can \ reconnect \ the \ branch \ run \ using \ \textbf{Move} \ \ref{eq:software}.$





APPENDIX C

Appendix: Deleting at Boundary Connections

If you delete a cable tray connected to another cable tray, cableway, or an equipment the software deletes all associated boundary connections. Also, if you delete a header run, or branch run, the software deletes all associated connections between the header and branch run.

The software deletes the mating parts if they are in as working state. If the mating part is in non-working state or in different satellite location, the software generates a To-Do record for that part.

You cannot delete a route object in non-working status, such as Approved, In Review, and Rejected. But, deleting route objects in a permission group with read-only access has few exceptions. Also, in a Global Workshare configuration deleting route objects at a different satellite location has exceptions. These exceptions are illustrated in the following topics.

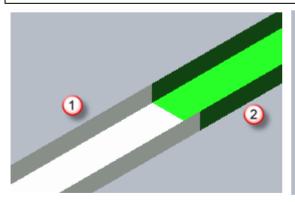
See Also

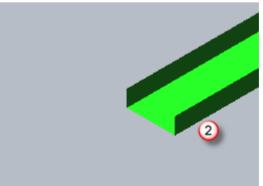
Cable tray to cable tray connections (on page 296) Header to branch connections (on page 301)

Cable tray to cable tray connections

ject	Approval Status	Permission Group Access
у А	Working	Full control/ Write
у В	Non-working	-
_		

Result: If you delete cable tray A, the software also deletes all associated connections.

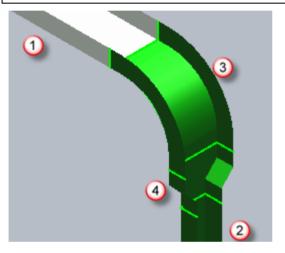


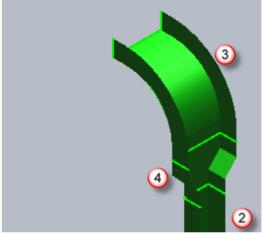


Before deletion

After deletion

No.	Route Object	Approval Status	Permission Group Access	
1	Cable tray A	Working	Full control/ Write	
2	Cable tray B	Non-working	-	
3	Turn feature associated with cable tray A			
4	Reducing transition associated with cable turn B			
Resu	Result: If you delete cable tray A, the software also deletes all associated connections.			

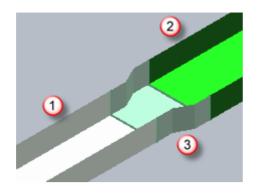


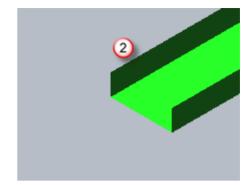


Before deletion

After deletion

No.	Route Object	Approval Status	Permission Group Access	
1	Cable tray A	Working	Full control/ Write	
2	Cable tray B	Non-working	-	
3	3 Reducer associated with cable tray A			
Result: If you delete cable tray A, the software also deletes associated objects, and connections.				



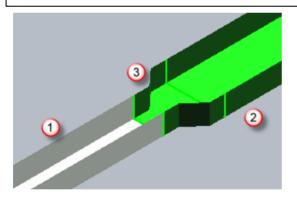


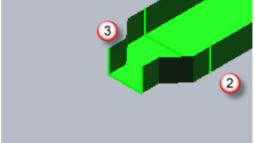
Before deletion

After deletion

No.	Route Object	Approval Status	Permission Group Access
1	Cable tray A	Working	Full control/ Write
2	Cable tray B	Non-working	-
3	Reducer associated with cable tray B		

Result: If you delete cable tray A, the software also deletes all associated connections. If the reducer is a mating part, the software generates a To Do Record. You must have Write access on the part to update the To Do Record.





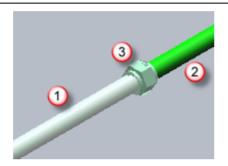
Before deletion

After deletion

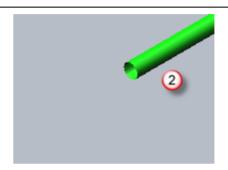
Conduit run to conduit run connections

Route Object	Approval Status	Permission Group Access
Conduit run A	Working	Full control/Write
Conduit run B	Non-working	-
Coupling associated with conduit run A		
	Conduit run A Conduit run B	Conduit run A Working Conduit run B Non-working

Result: If you delete conduit run A, the software also deletes associated objects and connections.



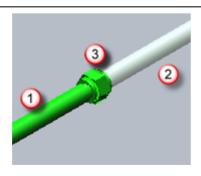




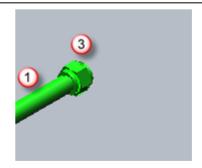
After deletion

No.	Route Object	Approval Status	Permission Group Access
1	Conduit run A	Non-working	-
2	Conduit run B	Working	Full control/ Write
3	Coupling associated with conduit run A		

Result: If you delete conduit run B, the software also deletes all associated connections. If the coupling is a mating part, the software generates a To Do Record. You must have Write access on the part to update the To Do Record.



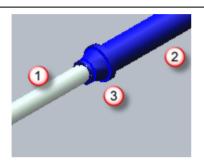
Before deletion

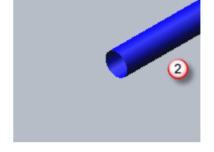


After deletion

No.	Route Object	Approval Status	Permission Group Access
1	Conduit run A	Working	Full control/ Write
2	Conduit run B	Working	Read-only
3	Reducer associated with conduit run B		

Result: If you delete conduit run A, the software also deletes the associated objects, and connections.



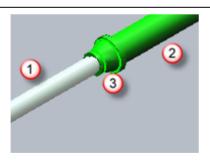


Before deletion

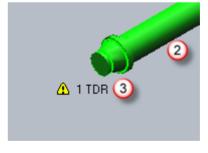
After deletion

No.	Route Object	Approval Status	Permission Group Access
1	Conduit run A	Working	Full control/ Write
2	Conduit run B	Non-working	-
3	Reducer associated with conduit run B		

Result: If you delete conduit run A, the software also deletes all associated connections, but does not delete the reducer. The software generates a To Do Record for the reducer.



Before deletion



After deletion

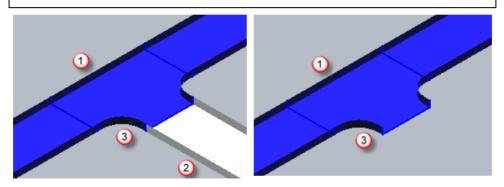
See Also

Conduit header to branch connections (on page 303) Header to branch connections (on page 301)

Header to branch connections

No.	Route Object	Approval Status	Permission Group Access
1	Branch run	Working	Full control/ Write
2	Header run	Working	Read-only
3	Tee associated with header run		

Result: If you delete the branch run, the software also deletes all associated connections, but does not delete the tee.

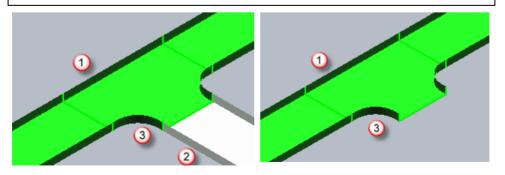


Before deletion

After deletion

No.	Route Object	Approval Status	Permission Group Access
1	Branch run	Working	Full control/ Write
2	Header run	Non-working	-
3	Tee associated with header run		

Result: If you delete the branch run, the software deletes all associated connections, but does not delete the tee. The software generates a To Do Record for the tee.

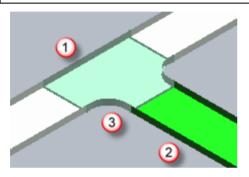


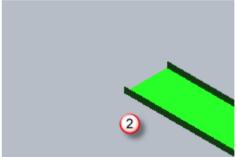
Before deletion

After deletion

No.	Route Object	Approval Status	Permission Group Access
1	Header run	Working	Full control/ Write
2	Branch run	Non-working	-
3	Tee associated with header run		

Result: If you delete the header run, the software also deletes all associated connections.



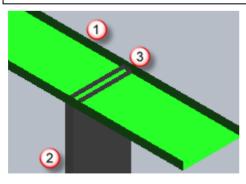


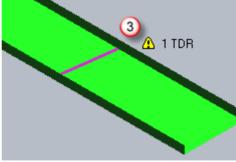
Before deletion

After deletion

No.	Route Object	Approval Status	Permission Group Access
1	Header run	Non-working	-
2	Branch run (cableway)	Working	Full control/ Write
3	Split/Along-leg feature associated with the header run		

Result: If you delete the branch run, the software also deletes all associated connections except the along-leg feature. The software generates a To Do Record for the along-leg feature.



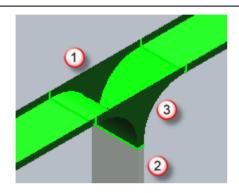


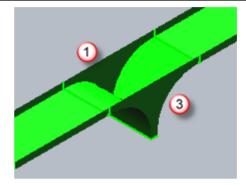
Before deletion

After deletion

No.	Route Object	Approval Status	Permission Group Access
1	Branch run	Working	Full control/ Write
2	Header run	Non-working	-
3	Vertical tee associated with header run		

Result: If you delete the branch run, the software also deletes the associated connections, but does not delete the tee. The software generates a To Do Record for the tee.





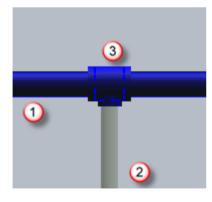
Before deletion

After deletion

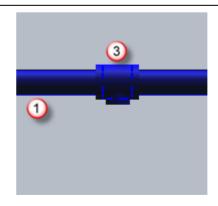
Conduit header to branch connections

No.	Route Object	Approval Status	Permission Group Access
1	Header run	Working	Read-only
2	Branch run	Working	Full control/ Write
3	Tee associated with header run		

Result: If you delete the branch run, the software also deletes all associated connections, but does not delete the tee.



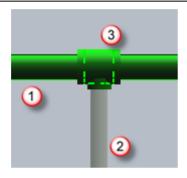


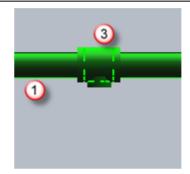


After deletion

No.	Route Object	Approval Status	Permission Group Access
1	Header run	Non-working	-
2	Branch run	Working	Full control/ Write
3	Tee associated with header run		

Result: If you delete the branch run, the software also deletes all associated connections. The software does not delete the tee, and generates a To Do Record for the tee.



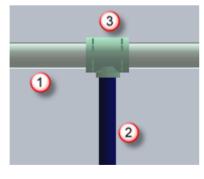


Before deletion

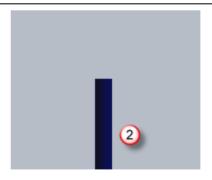
After deletion

No.	Route Object	Approval Status	Permission Group Access
1	Header run	Working	Full control/ Write
2	Branch run	Working	Read-only
3	Tee associated with header run		

Result: If you delete the header run, the software also deletes all associated objects and connections.



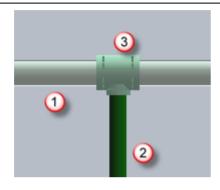


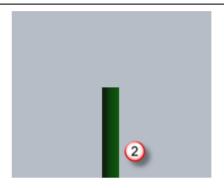


After deletion

No.	Route Object	Approval Status	Permission Group Access
1	Header run	Working	Full control/ Write
2	Branch run	Non-working	Read-only
3	Tee associated with header run		

Result: If you delete the header run, the software also deletes all associated objects and connections.





Before deletion

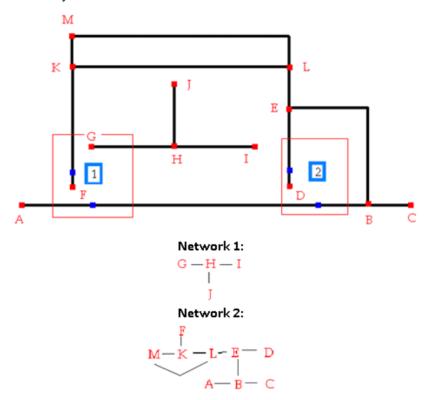
After deletion

APPENDIX D

Appendix: Cable Autorouting

This section provides a detailed explanation of the process the software steps through to autoroute cable in the 3D model.

1. When you click **Autoroute** on the **Edit Cable Path** ribbon, the software builds one or more nodal networks that represent all the cableways in the workspace. Each end feature of the cableway, every branch on the cableway, and every cableway run change are *nodes*. Whenever there are more than two paths between any two nodes, the software inserts a node at an arbitrary point (usually a turn) to split one of the paths (see node M in the following illustration). A *connection* is composed of the set of features that make up the path between two nodes. The total length of cableway is recorded for the connection along with the allowed signal types as read from the feature's parent cableway. Consider the following illustration in which two independent networks (Network 1 and Network 2) represent the cableway model:



NOTE The first time you run the **Autoroute** command in a session, the cableway network is created. For a large number of cableways/conduits, this can take several minutes. The next time you run the **Autoroute** command, however, the network is not regenerated unless you select **Cableway, conduits, or cables have been modified since last auto route** on the **AutoRoute Options** dialog box.

- The software removes connections between nodes if a feature in a connection is full and Allow overfilling of cabletrays is not selected on the Autoroute Options dialog box.
- 3. The software removes connections between nodes if you pick a feature in a connection as a "Do not pass" feature.
 - Next, the software takes the following steps for each individual cable being routed by a single execution of the **Autoroute** command. Each cable in the select set is routed independently and in a user-defined order.
- 4. The software removes connections between nodes if the allowed signal type for the cableway of that connection does not match the signal type of the cable being routed.
 - **NOTE** If the previously routed cable has the same signal type as the current cable, then the software skips Step 4. If it has a different signal type, then the network is trimmed starting from the original network condition at the end of Step 2. This means that you can save processing time by routing multiple cables with the same signal type at the same time.
- 5. The networks that have features that are members of connections which have not been removed/trimmed by the aforementioned rules within the maximum tail length range of both equipment items are selected for autorouting between equipment 1 and 2.
 - Using the illustration in Step 1 as an example, only Network 2 has features within the range of both equipment items. In this example, none of the connections (and hence none of the features) between nodes were removed due to a cable signal type or "Do not pass" rule.
- The software finds potential entry/exit points automatically on the closest feature of each
 cableway within the maximum tail range based on the cable entry option selected and
 selects a path such that the maximum length of the cable remains in the cableway or
 conduit..

■ NOTES

- If Allow cables to enter from cableway straight feature is selected on the Autoroute Options dialog box and the maximum tail range is as indicated by the red boxes in the previous illustration, the blue dots represent the automatically selected possible entry/exit points on each cableway of Network 2.
- You can select a required entry /exit point using Set Entry Point and Set Exit Point on the Edit Cable Path ribbon. These points apply to all cables that are selected for autorouting.
- 7. The software computes the path with the minimum length on the trimmed network between each possible pair of entry/exit points. The path with the minimum length that allows the maximum cable length to remain in the cableway or conduit, and also includes the ordered set of "go through" features is chosen.

■ NOTES

- If no path is possible between the entry/exit points that include the "go through" features, then the autoroute fails and an error message is placed in the log.
- You must select the "go through" branch features in the order that the cable must pass through them, running from the originating equipment to the terminating equipment. Selecting the "go through" features in order dramatically improves the performance of the shortest distance calculation because the software does not have to test all possible permutations of paths that include the "go through". Dijkstra's algorithm (http://en.wikipedia.org/wiki/Dijkstra's_algorithm) is used to process the network to find the minimum length path between the entry/exit points.

- As the software computes the path such that the maximum cable length remains in the cableway or conduit, the chosen path might not be the shortest path.
- 8. When you click **Finish** on the **Edit Cable Path** ribbon, the fill for every cableway feature in the automatically selected path of the cable is recalculated and updated in the database.
- If any cableway feature is full and the Allow Overfill option is not selected in the Autoroute
 Options dialog box, the connection containing the feature is removed from the networks
 defined in Step 1.

■ NOTES

If a cableway feature is not full (this includes adjustment due to Fill Efficiency factor) before a cable is routed in that cableway, it is assumed that the cable can be routed regardless of how much space is actually left. In other words, a cable is allowed to overlap (but not fully exceed) the approximate boundary established by the fill efficiency. In the following illustration, the red line marks the boundary established by the fill efficiency. The last cable was successfully routed. Another cable will not be routed in the cableway. The cableway will report a fill greater than 100%.



The autoroute network with its fill values is stored in memory on your local machine. If you select **Update fill from database** on the **AutoRoute Options** dialog box, updates to the fill of the cableways that have been made by other users are automatically retrieved from the database prior to the onset of the autoroute. This focused update is much faster than running the common **Refresh** command on your workspace. If you are not using fill or are sure that no one else is routing cables in your cableways, then selecting the **Update fill from database** option will improve performance.

See Also

AutoRoute Options Dialog Box (on page 231)

APPENDIX E

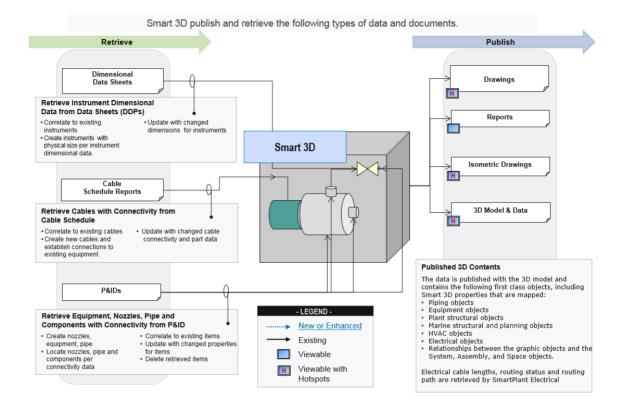
Appendix: Sharing Cable Data with SmartPlant Electrical

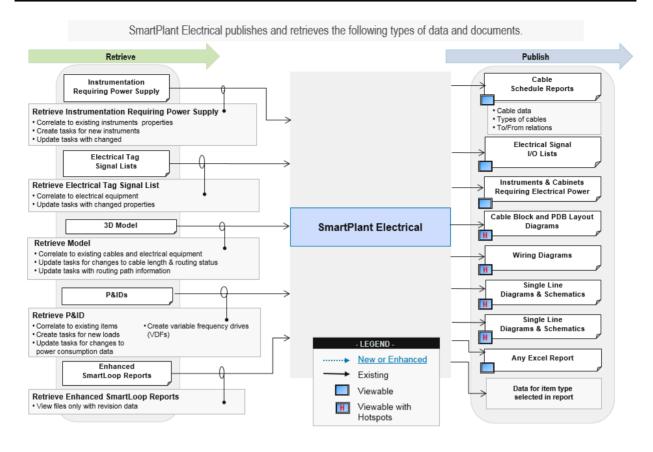
This appendix provides the general workflow for sharing cable data between SmartPlant Electrical and Smart 3D. If you have access to *Intergraph Smart Support*https://smartsupport.intergraph.com, then we highly recommend that you get the latest integration capability statement. Click **View Documentation**, and then under **Useful Links** click **Intergraph Work Process Guides**. Scroll down and under the **Integration Capability Statements**, select "Sharing Cable Data Between Electrical and 3D Design".

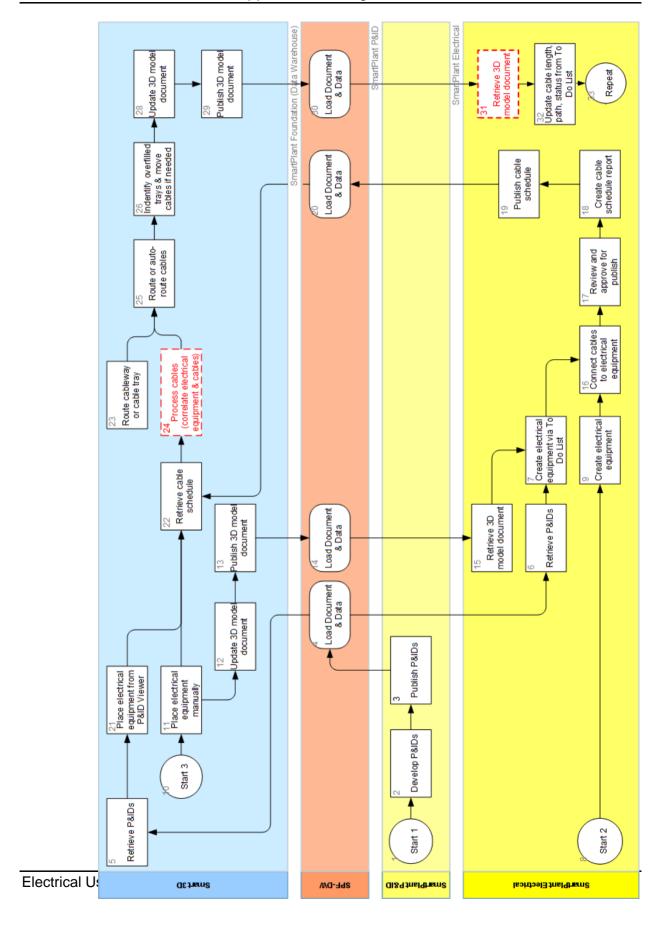
In This Appendix

Overall Workflow	310
Retrieving Cable Data	313
Publishing 3D Data	

Overall Workflow







Retrieving Cable Data

In an integrated environment, the **Electrical** task and SmartPlant Electrical can share a cable schedule, along with several cable properties.

You can retrieve a cable schedule using the **SmartPlant > Retrieve** command. Then, you can view the schedule and create or update cable objects while in the Electrical task within Smart 3D.

If you want to create cables in a specific electrical system, then you should select the system in the Workspace Explorer before viewing the cable schedule. If you do not select an electrical system, then the software creates the cables in an electrical system with the same name as the cable schedule document. If no such system exists, then the software creates one.

Your project may contain pumps with integrated motors or separate motors. Both situations are handled in the software. When retrieving cable data, Smart 3D searches the cable schedule and displays the cable connection in the **To/From** field for the cable connection. If the pump does not appear in the cable schedule, then the pump is referenced. You can visually see what is being created with the cable in the **To/From** field. Upon finding one or the other, a cable is created and connected to the motor or the pump.

View Cable Schedule

Displays retrieved cable schedules. You must retrieve cable schedules to view or create cables while in the Electrical task within Smart 3D. You can then update the cables. Use the **SmartPlant > Retrieve** command to retrieve electrical documents. This command is only available if you registered the active model with SmartPlant Foundation in the Project Management task. For more information on how to retrieve documents, see Retrieve Documents.

See Also

Cable Schedule Documents Dialog Box (on page 272)

The **SmartPlant > View Cable Schedule** command displays retrieved cable schedule documents into the model. The **View Cable Schedule** command is available only in Electrical task.

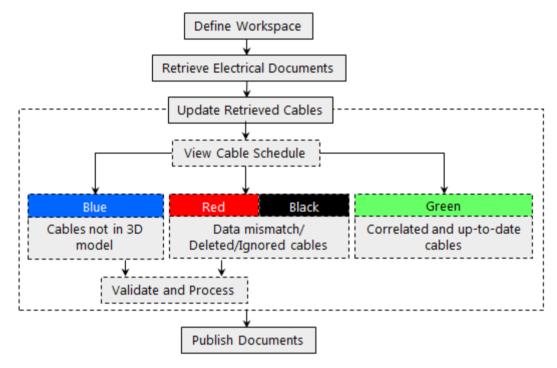
The retrieved cable schedule documents contain cable design basis data. You can select the retrieved cables, and create them in the 3D model using the cable schedule commands. All the processed cables will be created under a specified electrical system in the Workspace Explorer.

Before viewing the cable schedule, select an appropriate electrical system in the **Workspace Explorer** to create cables under that system. Smart 3D creates the cables with the same name as in the cable schedule document. If you do not select an electrical system, then Smart 3D creates a new system with the same name as the cable schedule document, and then creates cables under the new system.

Smart 3D searches the terminal equipment defined in the cable schedule, and automatically selects the equipment to which the new cable is connected. If the equipment is not in the model, then the cable is not created in the model.

You can then select the cables from the Workspace Explorer, and modify as necessary.

■ NOTE Any modifications made to the cables are reflected in the cable schedule only when you refresh the corresponding cables list.



See Also

Cable Schedule Documents Dialog Box (on page 272) Cable Schedule Dialog Box (on page 273)

Import cables (on page 271)

Cable Schedule Documents Dialog Box

Displays a list of retrieved cable schedules and their associated properties. Select a schedule, and then click **Open** to view the cables.

Name

Displays the name of the document.

Document Type

Displays the type of document.

Document Title

Displays the title of the document.

See Also

Cable Schedule Dialog Box (on page 273)

Cable Schedule Dialog Box

Displays a list of cables in a grid format.

View Cable Schedule Documents

Returns you to the **Cable Schedule Documents** dialog box. You can also press BACKSPACE.

Refresh

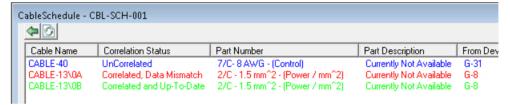
Updates the cable schedule. After modifying the cables in Smart 3D, click **Refresh** to reflect the changes in the cable schedule.

Cable Name

Displays the name of the cable as defined in the design basis data.

Correlation Status

Displays the correlations status of the cable design basis data with corresponding 3D model data. The colors identify the correlation status of each cable in the model and the design basis object that corresponds to it.



Default Color	Status	Description
	Correlated and up-to- date	The cable in the design basis has a match in the 3D model without any discrepancies in the cable data, and the data is up-to-date.
	Correlated, Data Mismatch	The cable in the design basis has a match in the 3D model. However, there are discrepancies in the cable data.
	Uncorrelated	The cable in the design basis does not exist in the 3D model, or is unknown.
	Ignored	The cable metadata in the design basis is ignored.

Part Number

Displays the part number for the cable as defined in the design basis data.

Part Description

Displays the short description of the cable part as defined in the design basis data.

From Device

Displays the cable originating equipment code as defined in the design basis data.

To Device

Displays the cable terminating equipment code as defined in the design basis data.

Signal Type

Displays the type of signal the cable will carry as defined in the design basis data.

Validation Status

Displays the validation status of the selected cable. The following are the available validation statuses:

Not Validated - Specifies that the cable is not validated. This is the default status.

Invalid - Specifies that the cable is missing a **Part Number**, **From Device**, or **To Device** data in 3D model. The missing value is highlighted in bold.

Valid - Specifies that the design basis cable has Part Number, From Device, and To Device data in 3D model.

Validate

Verifies if the selected cable has **Part Number**, **From Device**, and **To Device** data available in the 3D model.

Process

Imports or updates the selected cables. When you process the cables, the software creates the cables in 3D model and correlates with corresponding cable design basis data.

View Log

Displays a **CreateEFCables.log** file. The file contains information about successfully processed cables, and the cables that could not be processed due to data inconsistencies.

Include up-to-date cables

Appends Correlated and up-to-date cables to the current cable schedule.

Select All

Selects all the cables in the list.

Select Valid Cables

Selects all uncorrelated valid cables in the list.

See Also

Import cables (on page 271)
Cable Schedule Documents Dialog Box (on page 272)

Import cables

★ IMPORTANT

- You must retrieve at least one cable schedule to view the cable schedule. Use the SmartPlant > Retrieve command. This command is available only if you have registered the active model with SmartPlant Foundation in the Project Management. For more information on how to retrieve documents, see in the Common User's Guide.
- Before viewing the cable schedule, select an appropriate electrical system in the Workspace Explorer to create cables. Smart 3D creates the cables with the same name as in the cable schedule document. If you do not select an electrical system, then Smart 3D creates a new system with the same name as the cable schedule document, and then creates cables under the new system.
- Set the Active Permission Group to Electrical and assign the objects that you place in the model to the Active Permission Group.
- 1. Click SmartPlant > View Cable Schedule.
- 2. On the Cable Schedule Documents dialog box, select a cable schedule, and click Open.
- 3. On the **Cable Schedule** dialog box, set the **Include up-to-date cables** option as necessary.
 - PIP Include up-to-date cables option allows you to hide the cables that are already processed and up-to-date.
- 4. Select cables in the grid.
 - TIP You can click Select All, or use the CTRL or SHIFT keys to select multiple cables.
- 5. Click **Validate** to verify if the **Part Number**, **From Device** and **To Device** exist in 3D model data.

The selected cable is validated, and its validation status is updated. Any missing data is highlighted in bold text.

6. Select the validated cable, and then click **Process**.

NOTE For a cable to successfully process, its design basis data displayed on the list must match with corresponding 3D model data.

TIPS

- When you select a cable on the Cable Schedule dialog box, the corresponding cable is automatically selected in the Workspace Explorer.
- You can Autoroute ⁽¹⁾, or Delete ⁽²⁾ a processed cable without exiting the Cable Schedule dialog box.

See Also

Cable Schedule Documents Dialog Box (on page 272) Cable Schedule Dialog Box (on page 273)

Publishing 3D Data

You can publish 3D model data in the Drawings and Reports task or using the **Tools > Drawing Console** command. The model can then be viewed through SmartPlant Foundation or SmartPlant Review. For more information, refer to the Drawings and Reports Help.

3D Model Data

You can create a 3D Model Data component and base it on a specific filter. The filter defines the contents of the component documents when they are created. You can use the 3D Model Data component to output SmartPlant Review files or CAD (SAT) files.

Output as Neutral CAD (SAT) Graphics File

You can setup the 3D Model Data component to output your model objects to a neutral CAD (.sat) file format. Right-click the 3D Model Data component, and select **Setup** to set the filter and output file path.

Output as SmartPlant Review File

You can setup the 3D Model Data component to output your model objects as SmartPlant Review files depending on how you set up the 3D Model Data component. The software creates .vue and .xml files by default. If you select the **Generate streaming vue output (.zvf file)** option on the **Setup** dialog box, the software creates all three SmartPlant Review files: .zvf, .vue, and .xml.

You can set the output on the 3D Model Data component to save the SmartPlant Review (SPR) file to disk only, database only or both.

- Select Disk only (do not save to database) to save the generated graphics and data files to the specified path. You can then update and publish the 3D Model Data files to SmartPlant Foundation in an integrated environment. This option helps prevent data congestion by allowing you to save and publish your files locally.
- Clear Disk only (do not save to database) and do not specify output paths to save the data only to the database.
- Clear Disk only (do not save to database and specify the output paths to save the data to the database, and as files to the specified paths.

The basic workflow for creating a 3D Model Data component is as follows:

- Create a 3D Model Data component, and set it up with a filter and output file information.
- Create the 3D Model Data document (one document per 3D Model Data component).

■ NOTE SmartPlant Review shows the objects from the .vue file using global coordinates. If you plan to save the 3D Model Data component documents to a .vue file using the Save as SmartPlant Review File command, right-click the component and select Properties to check the Style tab Coordinate System property setting. You want to make sure the Plant Monument Coordinate Offset is passed correctly to SPR when creating the .vue file. The

offset value allows you to see the original coordinates relative to the new SPR coordinate system.

- Revise the documents if publishing to SmartPlant Foundation.
- Set properties Surface Styles and Aspects properties as needed on the 3D Model Data documents.
- Update the documents using Update Now or Batch > Update on the 3D Model Data component shortcut menu.
- If SmartPlant Foundation requires a password, you are prompted to type it when updating 3D Model Data documents.
- Save the documents to a predefined location for viewing in SmartPlant Review or publish the documents to the registered SmartPlant Foundation plant.

Recommendations for Exporting to SmartPlant Review

- The number of objects generated by a 3D Model Data component and exported successfully to a SmartPlant Review file depends largely on the type of objects and your hardware resources. We recommend that you limit each 3D Model Data component filter.
- Monitor the error logs regularly for resource issues, even if the specified filter worked initially.
 You can add more objects to the model meeting the filter criteria.
- SmartPlant Review (SPR) version 6.1.0.15 (or higher) allows you to open multiple .vue files simultaneously. Refer to your SmartPlant Review documentation for more information. When you open .vue and .xml files in SPR for the first time, SPR builds a database containing the tag information for the files. This process can take a significant amount of time.
- SmartPlant Review (SPR) version 6.2.0.29 (or higher) supports turning SmartPlant aspects on and off. All aspects are turned on by default in SPR. The SPRSchema.txt file can be customized to add any customized aspects.

NOTE The **3D View Control** used for viewing the published graphics in SmartPlant Markup Plus does not currently support turning aspects on and off.

Project Supervisor Setup

Your project supervisor should set up appropriate filters that define the objects to include in the component documents when they are created.

You must install the **SmartPlant Schema Component** and the **SmartPlant Client** to use this component.

3D Model Data Component Common Tasks

The following tasks are used to set up a 3D Model Data component and configure it for viewing in SmartPlant Review or publishing.

Define Your Workspace

The defined workspace does not need to include objects being manipulated for SmartPlant Review.

Setup a 3D Model Data Component

You can create and set up a 3D Model Data component to create SmartPlant Review output files or neutral CAD (SAT) graphics files.

Create the 3D Model Data Document

To create the 3D Model Data document, right-click the component and select the **Create Drawing** command. When this command is complete, the document is listed in the **Detail View**.

Set Surface Style Rules and Aspects for 3D Model Data Documents

Before you update your 3D Model Data documents, set the surface style rules and aspects to use for the model objects. You can specify the properties for the 3D Model Data component and documents by right-clicking and selecting **Properties**.

Update 3D Model Data Documents

Update your 3D Model Data documents using **Update Now** or **Batch > Update** on the component or document shortcut menu.

Save Data as a SmartPlant Review File

You can output your 3D Model Data to a SmartPlant Review (.vue) file whether you are working in a stand-alone or integrated environment.

Set Revision Information

The document revision process is separate from the publishing process, making it possible to revise a document locally and save it to the database without re-publishing the document.

Publish Data

If your model has been registered using the SmartPlant Registration Wizard, you can publish your 3D Model data for retrieval in other tools.

Setup (3D Model Data Component)

Sets options for a 3D Model Data component. This command is available on the shortcut menu on a 3D Model Data component.

Setup Dialog Box (3D Model Data Component) (on page 321)

With this command, you specify a filter that identifies the objects you want collected by the 3D Model Data component. You have several combination options for output of the objects:

- SmartPlant Review graphics file (VUE)
- CAD output file (SAT)

The CAD export function supports the following:

 Color information and transparency values - The software can retrieve color information and transparency values from the styles and apply them to the SAT file. If no style is selected, the default 3D object style is applied. If there is no style associated with an object, green is applied by default.

You do not need to define the workspace or verify that the workspace contains all of the objects required by the 3D Model by Query filter subset.

■ NOTES

- You can publish .zvf files and launch SmartPlant Review to view the .zvf files. You can also use File > View and Markup to use SmartPlant Markup Plus to navigate the model. You do not have to use the Save as SmartPlant Review command to use the SmartPlant Review features.
- After you create a component, you must update the documents to extract the data from the database to create the .vue, .zvf, and .xml files.

Setup Dialog Box (3D Model Data Component)

Sets options for the 3D Model Data component. You access this dialog box when you right-click a 3D Model Data component and select **Setup** on the shortcut menu.

Filter

Identifies the filter to use to define the objects to include in the component definition. The filter needs to be specific to the objects that you want to publish or to save to a SmartPlant Review file.

TIP You do not need to define the workspace to contain all of the objects required by the 3D Model Data filter subset.

Options

Specifies how the 3D Model Data is saved. The setup for your 3D Model Data component is different depending on whether or not you are registered to work in an integrated environment.

Generate SmartPlant Review output (.vue file)

Indicates that you want the 3D Model Data saved as a SmartPlant Review .vue file.

Generate streaming vue output (.zvf file)

Indicates that you want the 3D Model Data saved as a .zvf file in addition to a .vue file. Check this option if you intend to attach this data as a reference to another plant. The .zvf format allows you to attach this plant data as a reference to another plant using Reference 3D functionality.

Generate CAD output (.sat file)

Indicates that you want the 3D Model Data saved as an SAT graphics file.

Disk only (do not save to database)

Specifies how the graphics and/or data files are saved:

- Select Disk only (do not save to database) to save the files only to the specified path.
 You can then update and publish the .vue or .zvf file to SmartPlant Foundation from the designated locations.
- Clear the Disk only (do not save to database) and do not specify output paths for the data to only be saved to the database.
- Clear the Disk only (do not save to database and specify the output paths to save the data to the database and as files to the specified paths.

You can change this option at any time during your work so that you can determine the best save and publish options for your specific environment.

Path to save graphics file

Specifies the file to which the graphics for the 3D Model Data will be saved. Click the ellipsis button to browse for the correct file.

Path to save data file

Specifies the file to which the data will be saved. Click the ellipsis button to browse for the correct file. This box is automatically populated, and the ellipsis button does not display when you specify a .vue file. For example, if you specify C:\temp\tpjtest.vue in the **Path to save graphics file** box, then the **Path to save data file** box automatically displays C:\temp\tpjtest.xml.

■ NOTES

- You can publish .zvf files and launch SmartPlant Review to view the .zvf files from within SmartPlant Foundation. You do not have to use the **Save as SmartPlant Review** command to use the SmartPlant Review features. For more information on publishing, see Publish.
- For more information about the SmartPlant Registration Wizard, see Working in an Integrated Environment in the Intergraph Smart™ 3D Installation Guide, available from Help
 > Printable Guides.

See Also

Setup (3D Model Data Component) (on page 320) Setup a 3D Model Data component (on page 322) 3D Model Data Component Common Tasks (on page 319)

Setup a 3D Model Data component

The 3D Model Data component is used with the **Save as SmartPlant Review** and **Publish** commands. It is also used to output model graphics to neutral CAD (.sat) files. Before creating a 3D Model Data component, you should create filters that specify the objects required for your output.

- 1. Right-click a folder in the **Console**.
 - TIP To add a folder, right-click the root or another folder.
- 2. On the shortcut menu, select **New**.

The Add Component dialog box displays.

- 3. Select the **3D Model Data** component, and click **OK**.
- 4. Right-click the new 3D Model Data component and then select **Setup**.
- 5. Specify a filter to identify the model data to include when the data is saved or published. Select **More** to display the **Select Filter** dialog box. Click **Properties** to display the current filter properties.
- 6. If you need to output the 3D Model Data to SmartPlant Review, select **Generate SmartPlant Review output (.vue file)**. If you need to output the data as a neutral CAD format graphics file (.sat file), select the **Generate CAD output (.sat file)** option.
- 7. Select or clear the **Disk only (do not save to database)** option to specify how to save the 3D Model Data. If you are registered in an integrated environment, checking this option allows you to update and publish the output files to SmartPlant Foundation.

■ NOTE When saving as SmartPlant Review files, the behavior of the 3D Model Data setup is different depending on whether you are registered to work in an integrated environment or not. For more information on how this option affects the saved data, see Setup Dialog Box (3D Model Data Component) (on page 321). For more information on registering your model using the SmartPlant Registration Wizard, see the section titled Working in an Integrated Environment in the Intergraph Smart[™] 3D Installation Guide, available from the **Help > Printable Guides** command.

- 8. Specify file paths for the data file and the graphics file as needed.
- 9. Click **OK** to save the component settings and create the output files as specified.

■ NOTES

- After you create a component, you must update the documents to extract the data from the database and create the .vue, .zvf, and .xml files. For more information on tasks associated with the 3D Model Data component, see 3D Model Data Component Common Tasks (on page 319).
- If you are setting up the 3D Model Data component with the intention of saving it as a SmartPlant Review (SPR) file, right-click the component and select **Properties** and go to the **Style** tab to make sure the **Coordinate System** property is set appropriately so that the **Plant Monument Coordinate Offset** is passed correctly to SPR when creating the VUE file. This is because SPR shows the objects from the VUE file using global coordinates. The offset value allows you to see the original coordinates relative to the new SPR coordinate system. For more information on 3D Model Data components, see *3D Model Data* (on page 318). For information on saving to SPR, see Save as SmartPlant Review File.
- If you are setting up the 3D Model Data component for output to the CAD format graphics file, you can export color and transparency style rules along with the objects to the SAT file when it is created. To set the style for export, right-click the 3D Model Data component and select **Properties**. Go to the **Surface Styles and Aspects** tab, select the style and click **Add**. This property tab includes the style rules that are created in the **Common** task. You can also create new styles by clicking **New**. After the style is set, right-click the 3D Model Data component and select **Update Now** to create the SAT file with the specified style.
- Because the AutoCAD software can open only SAT files of version 5, the ACIS version in the SAT file is written as 5 by default. If you want to output the current ACIS version, contact Intergraph Support (http://www.intergraph.com/support) or your local office.
- For the SAT output, all the bodies are merged and then saved to the SAT file. If you are using viewers, such as MicroStation, that cannot open merged bodies, contact *Intergraph Support* (http://www.intergraph.com/support) or your local office.

See Also

Setup (3D Model Data Component) (on page 320)

Glossary

abstract part

A part that is only defined by a partial specification and that cannot be materially provided by the organization that defines the specification.

Active Template Library (ATL)

Set of class templates and wizards supplied with Microsoft C++ Version 5.0 and later. You can use an ATL when you create ActiveX controls and any other type of object that uses the Component Object Model (COM) model. Using an ATL is generally preferred over Microsoft Foundation Classes (MFC), because the implementations are smaller, easier to use, and more closely tied to the COM model.

airway

A user-defined path for routing cables outside of a cableway. Examples include jumping between trays, drop-offs to equipment, and so forth.

ampacity

The current-carrying capacity, expressed in amperes, of a wire or cable under stated thermal conditions.

angle

The circular measurement taken from the intersection of two pipes at a turn or branch.

approval state

Recorded state of acceptance of information contained in objects within the database. The approval states indicate a level of confidence in the information stored in the database and govern your ability to alter specific data about a product.

arrangement (accommodation)

Those components of a system arranged in three-dimensional space with accurate dimensional representation for installation. Various types include electrical, HVAC, machinery, outfitting, and piping.

arrangement (electrical)

Electrical system arranged in three-dimensional space with accurate dimensional representation for installation. This arrangement is generally shown as a wireway or trunk that contains cable from multiple systems.

attribute

A single type of non-graphics information that is stored about an object such as diameter or end preparation.

axis

An imaginary line used to define the orientation of a system or object normally defined in terms of an x-, y-, and z-axis. Some 3-D graphic objects have an associated axis used to define the center or axis for rotations.

basic design

Engineering definition of the model and its systems.

bill of material (BOM)

Hierarchical decomposition of a product into constituent assemblies and parts. Specific types of BOMs exist (for example, an EBOM is a bill of material from the point of view of an engineering department; an MBOM is a bill of material from the point of view of manufacturing).

bulkload

The process by which reference data in Microsoft Excel workbooks is loaded into the Catalog database.

bus

A conductor, or group of conductors, that serve(s) as common connector for two or more circuits.

busbar

A conducting bar that carries heavy current to supply several electric circuits.

cabinet

An enclosure designed either for surface or flush mounting and provided with a frame, mat, or trim in which a swinging door or doors may be hung. See also enclosure.

cable

A conductor with insulation, or a stranded conductor with or without insulation and other coverings (single-conductor cable) or a combination of conductors insulated from one another (multiple-conductor cable). See also optical cable.

cable core binder

A wrapping of tapes or cords around the several conductors of a multiple-conductor cable used to hold them together.

NOTE Cable core binder is usually supplemented by an outer covering of braid, jacket, or sheath.

cable filler

The material used in multiple-conductor cables to occupy the interstices formed by the assembly of the insulated conductors, thus forming a cable core of the necessary shape (usually circular).

cable hanger

Description of all physical cableway supports.

cable jacket

A protective covering over the insulation, core, or sheath of a cable.

cable schedule

A list of cables for a given unit or project. A cable schedule includes cable names, cable parts, termination information, and electrical service levels.

cable shielding

A nonmagnetic, metallic material applied over the insulation of the conductor or conductors to confine the electric field of the cable to the insulation of the conductor or conductors.

cable terminal

A device which provides insulated egress for the conductors.

cableway

Term to describe the volumetric path in a model design through which one or more cables pass from one location in the model to another. Cableway is synonymous with, and is used instead of, raceway or wireway.

cableway load

Weight per unit length supported by a cableway segment.

catalog

Repository of information about components and materials used in construction. When you use catalog parts in the model, the software places an occurrence of the catalog part in the project. This occurrence is a copy of the actual catalog part.

Catalog database

The database that contains the reference data. Each model database can reference a different Catalog database.

chain

A set of continuous and tangent segments.

change history

Process of recording information such as who, when, and why for any given modification.

change management

Software features or manual procedures for managing the consequence of change. For example, software can support a change management feature to report drawings that need updating as a result of a change in a 3-D model.

change propagation

Ability of the software to intelligently modify dependent design information to reflect change in a higher order object.

channel (electrical)

1) A single path for transmitting electric signals, usually in distinction from other parallel paths. 2) A band of frequencies.

circuit

A conductor or system of conductors through which an electric current is intended to flow.

circuit breaker

A device used to open and close a circuit by non-automatic means, and to open the circuit automatically on a predetermined overload of current, without injury to itself when properly applied within its rating.

circular bar

A structural shape referring to a cylindrical solid.

class

Grouping of individual objects that share some very significant, common characteristics.

classification folder

A folder in the Catalog hierarchy that contains part classes. Classification folders are one level above part classes. The ClassNodeType and R-ClassNodeDescribes sheets in the Microsoft Excel workbooks define the classification folders.

codelist

A set of acceptable values for a particular property that can be referred to by an index number or selected in a combo box. For example, the codelist for the material specification allows you to select from a set of standard entries, such as ASTM A183-F316 Stainless Steel.

commodity code

A user-defined code that provides an index to parts in a catalog.

commodity item

A standard component found in a manufacturer catalog (an off-the-shelf component).

component

Physical part that a feature generates.

concurrent access

Ability of the software to allow multiple users to simultaneously access and modify the design of a model.

conductor

1) A substance or body that allows a current of electricity to pass continuously along it. 2) A wire or combination or wires not insulated from one another, suitable for carrying an electric current. It may be bare or insulated.

conduit (flexible)

Conduit built up of spiral metal strips that interlock. It is not moisture proof and hence cannot be used where the action of any considerable amount of moisture is objectionable.

conduit (rigid)

Conduit that is fireproof, moisture proof, reliable, and mechanically strong. This type of conduit is generally employed when wires are installed in cableways.

conduit body

A separate portion of a conduit or tubing system that provides access through a removable cover(s) to the interior of the system at a junction of two or more sections of the system or at a terminal point of the system.

conduit fitting

An accessory that serves to complete a conduit system, such as bushings and access fittings.

conduit seal

A sealed fitting designed to contain an explosion in the enclosure to which it is attached and to minimize passage of flammable gases or vapors from one location to another.

consolidated tasks

A collection of tasks run in batch. For example, the software allows you to extract a set of drawings immediately or to schedule the batch extraction for a future time.

constraints

A logical restriction that controls how part symbols ports relate to each other and to reference ports. There are four constraints: parallel, perpendicular, coincident, and distance.

contract

A Work Breakdown Structure object representing a scope of work, usually performed by an external supplier. The contract is related to a project and appears in the Work Breakdown Structure hierarchy.

coordinate

The location of a point along the X-, Y-, or Z-axis.

coordinate system

A geometric relation used to denote the location of points in the model. The most common coordinate system is the rectangular coordinate system, whereby points are located by traversing the X-, Y-, and Z-axes of the model. Normally, coordinate systems have their origin defined as 0,0,0.

cutting plane

A plane that cuts through an object.

damage records

Data relating to the damage and repair of structure or components that occurred during or after construction of a plant.

data interchange

Capability to output the design, or portions of the design, in a standard format for use or movement to another computer software system.

database

Repository for the product model data. The database contains information to describe individual objects in the data model and the relationships between objects as appropriate.

database backup

Process of recording a backup copy of the complete database or the incremental changes after the date that the last complete copy was created.

database break and recovery

Utilities used to restore a database after files are corrupted.

database copy

Functionality to copy large collections of model objects from one design project to another design project.

database management

Functionality related to managing a product model database.

database monitor record

Transactions that occur in order to provide database (DB) recovery after a stop in response with a minimum of lost data.

degree

The highest polynomial factor in the curve or surface mathematical definition. A line is a degree 1 curve, while a cubic B-spline is a degree 3 curve.

de-rating factor

A factor that reduces the current-carrying capacity (ampacity) of a cable due to its method of installation. This factor is affected by the size and type of tray or conduit, whether or not the cables are installed in air or laid in the ground, ambient temperature, proximity of cables with one another, and so forth. This de-rating factor does not apply to cable tray; it is a factor applied to each cable depending on the method of installation.

design alternative

Difference in a design represented by a separate version. A design alternative can be a new design prepared as a proposed change, or one of several elective options that the builder or customer selects. Each design alternative has an identification assigned so you can uniquely refer to the design alternatives.

design approval log

Record of review and approval of parts of the design.

design data auto input

Automation in loading existing design data into a new design database.

design documents

Drawings, sketches, material lists, procedures, and so forth that are generated during the design phase.

design object

Any object with properties that you can select. A design object can be related to one or more contracts of different types, but related only to one contract of a given type.

design progress check

Analysis of the content of the design to some metric unit that gives an idea of the degree of completion.

design review

Functionality to support rapid viewing of the design and markup of features with comments.

design service

Any general system services related to the design function.

design standard

Feature or object used in plant design that has been determined to the normal or approved way of accomplishing a design requirement. In the context of computer software, the term refers to computer functionality to support standards, not the standard itself.

detail schedule

Lowest level of schedule used to manage and track work progress.

diagram (2-D)

Diagram that shows the topology, functional components, wiring connections, and special requirements of an electrical or electronics system. Generally represents the engineering design of the system.

distributed systems

Systems consisting of sequential parts with a distributive characteristic (for example, pipes distribute fluids, HVAC distributes air, cabling distributes power, and structure distributes loads).

distribution systems

Term synonymous and used interchangeably with the term distributed systems.

division

Intersection in a cableway at which the cross section divides into two or more individual cableways.

documentation

Drawings and other records that you must produce to document, obtain approval, or build the design.

drawing tool

Tool that helps in the process of creating, modifying, or manipulating objects. Examples are PinPoint and SmartSketch.

duct bank

A concrete-encased underground container used for laying conduits for electric and telephone lines, as well as other utilities. In general, two or more conduits routed side-by-side create a bank. Duct banks are generally sloped to drain off condensation.

easting

A term that describes an east coordinate location in a coordinate system.

edge

A topological object that represents a trimmed curve bounded by a start and end vertex.

edge distance

The distance from the center of a bolt or rivet to the edge of a plate or flange.

electromagnetic interference (EMI)

Undesirable coupling of electrical, magnetic, or radio wave energy between electrical circuits or cables causing unwanted effects on systems and on electrical or electronic components.

enclosure

A surrounding case or housing used to protect the contained conductor or equipment and protect personnel from contacting live parts.

equipment catalog

Catalog of equipment geometry and limited properties that the software uses to identify and visualize equipment and its placement in the model. The catalog is not the source for the total specification and ordering data for the object.

fabricate

To cut, punch, and sub-assemble members in the shop.

face-to-face

The overall length of a component from the inlet face to the outlet face.

fasteners

Bolts and rivets used to connect structural members.

element

Primitive geometric shape such as a line, circle, or arc.

feeder

 A set of conductors originating at a main distribution center and supplying one or more secondary distribution centers, one or more branch-circuit distribution centers, or any combination of these two types of equipment.

 All circuit conductors between the service equipment, or the generator switchboard, and the final branch-circuit overcurrent device.

fence

Boundary or barrier that separates or closes off an area. To surround or close like a fence.

field adjustment

Material added to the neat design geometry of piping or structural parts to allow for fit up in the case that extra material is required due to uncontrolled variance in the manufacturing and construction process.

fill calculations

Computations that find the percent fill of cable tray or conduit. In the software, these calculations comply with the National Electric Code. It is possible to modify the delivered algorithm to satisfy other standards. Fill information can be viewed on fill reports. In addition, maximum fill is stored on the straight features in the model, and you can view this information on ribbons or property pages.

fill efficiency

A factor that provides for future expansion of cable. The user enters this factor. It allows the user to ensure that there is always spare capacity in the cable tray or conduit. For example, a fill efficiency set to 80% denotes that a run of cable tray should be considered full when 80% of the allowable cable is contained in the tray.

fill factor

The percentage of the tray or conduit that you allow to be filled with cables. A percentage of free space is defined to allow for power cable spacing needs, snaking of cables, allowances for bending radii on the tray, and for future expansion.

fitting

An accessory such as a locknut, bushing, or other parts of a wiring system that is intended primarily to perform a mechanical rather than an electrical function.

flavor

A different variation of a symbol. Each variation has different occurrence property values.

focus of rotation

A point or line about which an object or view turns.

full penetration weld

A type of weld in which the weld material extends through the complete thickness of the components being joined.

function points

Part of the requirements documentation, function points are the smallest granularity of a requirement statement that describe specific detailed actions that the software performs.

functional block diagram

Schematic representation of a system (piping, electrical, ventilation) showing system parts and their relationship. You use symbols to represent equipment and components. A connecting network of lines illustrates their relationship. Taken together, the symbols and the network illustrate the function of the system.

furnishings

Parts such as movable articles and fittings that normally are not associated with a system (for example, a chair).

generic specific

Object that is parametrically defined or defined to suit a family of specific parts (for example, International Standards parametrics). For example, a 100 - 200 gpm pump in the catalog can provide a general shape to appear in the model until a specific object has been identified. See also specific and specific object.

ground

A conducting connection, whether intentional or accidental, by which an electric circuit or equipment is connected to the earth, or to some conducting body of relatively large extent that serves in place of the earth.

GUIDs

Acronym that stands for Globally Unique Identifiers. The software automatically creates the GUIDs sheet in the Excel workbooks when you create the Catalog database and schema. The purpose of storing GUIDs within Excel workbooks is to help you keep track of what has been loaded into the database. Storing GUIDs also helps to avoid the situation in which a replacement Catalog database causes existing models to become invalid.

host location

The first location created for a Site. This host location is defined when the Database Wizard creates the Site database.

host server

The database server on which the Site database was created using the Database Wizard. Alternatively, if it is a restored database set, the Host Server is the database server where the Site database is restored. The Host Server in a Workshare environment contains the origin for the Site, Site Schema, Catalog, and Catalog Schema databases. Consequently, most Project Management and reference data work must take place at the Host.

impedance

A measure of the total opposition to current flow in an alternating-current circuit, equal to the rms electromotive force in the circuit to the rms current produced by it, and usually represented in complex notation as Z = R + iX, where R is the ohmic resistance and X is the reactance.

initial design

Early stage of design work, generally before contract, used to estimate construction costs and provide a rough concept of the intended plant. Contains information relating to a plant created during its initial (concept) design period.

initial structural plan

Principal structural plan for the plant; also called a construction profile.

instantiation

Occurrence of a catalog object at a specific geometric location in the model.

insulation

The part that is relied upon to insulate the conductor from other conductors, conducting parts, or from ground.

insulation level

An insulation strength, expressed in terms of a withstand voltage.

interference checking

A process that identifies possible collisions or insufficient clearance between objects in the model.

job order

Industrial authorization for accomplishing work; synonymous with a work order.

junction box

A box with a blank cover that serves the purpose of joining different runs of cableway or cable and provides space for the connection and branching of enclosed conductors.

kinematics analysis

Analysis of mechanical motion.

ksi

Kips per square inch.

leg length analysis

Preferred term is welding length analysis.

library

Resource of reference information that you can access in developing a plant design.

life cycle database

Information developed to assist in the maintenance and modernization of delivered plants.

link

Way to store information about another file in your document. You can update a link so that changes in the file appear in your document.

lintel

A horizontal member used to carry a wall over an opening.

load (electrical)

1) A device that receives power or the power or apparent power delivered to such a device. 2) The electric power used by devices connected to an electrical generating system.

load group

A grouping in which all components feature uniform load limits and stress safety characteristics. For example, if a pipe clamp from load group 5 has a maximum nominal load of 20kN, then so does a threaded rod from load group 5.

location

A Location is defined by three user-defined inputs: 1) a unique name, 2) a unique name rule ID, and 3) the server where the Site databases reside for that Location. A Location is defined and created when the Site database is created using the Database Wizard. Additional Locations can be created in the Project Management task. Each Location is a Site-level object, thus other Plants within the same Site collection can use the Locations when the Plants are configured for Workshare.

logical member

An object in the model used to represent the design topology.

lug (electrical)

A wire connector device to which the electrical conductor is attached by mechanical pressure or solder.

machinery

Major pieces of equipment installed in a plant.

macro

A sequence of actions or commands that can be named and stored. When you run the macro, the software performs the actions or runs the commands. You can create the macros in Visual Basic or other OLE-aware programming applications. Some of the other OLE-aware programming applications are Visual Basic for Applications, Visual C++, and so forth.

maintenance envelope

A rectangular box around the part for clearance during maintenance operations.

maintenance records

Records of breakdown, repair, and overhaul of equipment.

manhole (electrical)

More accurately termed splicing chamber or cable vault, a subsurface chamber, large enough for a man to enter, in the route of one or more conduit runs and affording facilities for placing and maintaining in the runs, conductors, cables, and any associated apparatus.

master run

The cableway run along which a set of cableways is routed.

material analysis

Analysis of a completed design work for extracting detailed material requirements; also called material lists.

material list

An option category that controls the format and content of the bill of materials.

methods

Objects in the database that describe the manufacturing methods to the component parts of a plant.

move from point

Starting point for an action. For example, when you move an equipment object, the Move From point determines the point of origin for the move.

move to point

Ending point for an action. For example, when you move an equipment object, the Move To point determines where you want the move to stop.

MTO neutral file

A non-graphic output file that can be fed into a material control system. MTO stands for Material Take-Off.

node

- One of the set of discrete points in a flow graph.
- A terminal of any branch of a network or a terminal common to two or more branches of a network.
- An end point of any branch or a network or graph, or a junction common to two or more branches.

northing

A term that describes a north coordinate location in a coordinate system.

nozzle

A piping connection point to a piece of equipment.

nozzle standout

The shortest allowable distance between the connection point of a nozzle and the start point of a turn on the leg connected to the nozzle.

NPD (Nominal Piping Diameter)

The diameter of a pipe.

object

A type of data other than the native graphic format of the application.

occurrence (of part or equipment)

Instantiation of a part of equipment in the model that refers to the part library; an instance of a specific object. The design can be built several times, and therefore the occurrence can apply to more than one hull. Typically, an occurrence points back to a specific object, either for its complete definition, as in the case of a particular valve, or for its made from material, as in the case of a steel plate part cut from sheets. Thus, when a designer selects a component from the catalog and places it at a location in the space of the plant, the software creates an occurrence of that object in the plant design.

occurrence property

A characteristic that applies to an individual object in the model. Occurrence properties are designated with 'oa:' in the reference data workbooks. You can view and modify occurrence properties on the Occurrence tab of the properties dialog boxes in the software. Depending on the object, some occurrence properties are read-only.

optical cable

A fiber, multiple fibers, or fiber bundle in a structure fabricated to meet optical, mechanical, and environmental specifications.

origin

In coordinate geometry, the point where the X-, Y-, and Z-axes intersect.

origin point

The point at which the coordinate system is placed, providing a full Cartesian coordinate system with positive and negative quadrants. Points are placed at coordinates relative to the origin point, represented by the X, Y, and Z values.

orthogonal

The characteristic of an element consisting completely of elements positioned at 90-degree angles. A square is an orthogonal element.

orthographic

A depiction of an object created by projecting its features onto a plane along lines perpendicular to the plane.

P&ID

Diagram that shows the topology, functional components, and special requirements of a piping system; generally represents the engineering design of the system.

package

Set of closely related classes. (UML)

painting

Computation of paint surface and recording of paint system requirements.

parallel cable

A group of cables routed together. The child cables all have the same part number, terminating devices, and path.

paralleled cable

A cable that has identical siblings that have the same part number and follow the same path. A paralleled cable must have at least one sibling and be the child of a parallel cable object.

parameter

A property whose value determines the characteristics or behavior of something.

part class

A group of similar objects. You can define part classes in the Excel workbooks. A part class can have multiple parts. For example, a heat exchanger part class can contain heat exchangers with different dimensions.

part number

Unique identifier of a part.

path (electrical)

1) A line connecting a series of points in space and constituting a proposed or traveled route. 2) The set of links and junctions joined in series to establish a connection.

PDS (Plant Design System)

A comprehensive, intelligent, computer-aided design and engineering application for the process, power, and marine industries. PDS consists of integrated 2-D and 3-D modules that correspond to engineering tasks in the design workflow.

PinPoint

Tool that allows you to place, move, and modify elements with precision, relative to a reference point.

principle of superposition

The principle that states that the stresses, strains, and displacements due to different forces can be combined. This principle is only valid for linear analysis.

Product Data Management (PDM) System

Software intended to manage both product data and documents associated to the product data. Functionality typically includes: object-based data modeling tools, user administration, business rules, and document management. Document management typically includes document editing or reviewing, document mark-up or redline, document storage, and full-text retrieval.

product structure

Hierarchical breakdown or decomposition of a product into constituent parts, volumes, or units. (For example, a bill of material is one possible type of product structure.)

production planning

Functionality associated with the work breakdown and sequence of the construction of a plant.

promotion

Process of associating approval state with a product version. A product version begins its existence at a working approval state. When the version is at some level of maturity, its approval

state is elevated to a higher approval state (that is, promoted). Then, further changes must be carefully controlled and generally require the data set demoted to a working state. One or more promotions can occur successively higher approval states (between working and approved) to represent various intermediate levels of review or progressive approval.

pull box

A box with a blank cover that is inserted in one or more runs of cableway to facilitate pulling in the conductors, and may also serve the purpose of distributing the conductors.

pulling tension

The longitudinal force exerted on a cable during installation.

query select sets

Set of objects that are selected in a query or queries on the database.

reactance

1) The imaginary part of impedance. 2) Opposition to the flow of alternating electric current caused by the inductance and capacitance in a circuit.

reel

The quantity of wire wound on a reel.

reference data

The data that is necessary to design plants or ships using the software. Reference data includes graphical information, such as symbols. It also contains tabular information, such as physical dimensions and piping specifications.

resistance

That physical property of an element, device, branch, network, or system that is the factor by which the mean-square conduction current must be multiplied to give the corresponding power lost by dissipation as heat or as other permanent radiation or loss of electromagnetic energy from the circuit.

resource estimation

Rough estimate of material, manpower, and facility utilization for the design and construction of the plant.

route

1) A line connecting a series of points in space and constituting a proposed or traveled route. 2) The set of links and junctions joined in series to establish a connection.

satellite server

The database server where the replicated databases reside for Workshare. The Satellite Server is not used unless Workshare is activated.

schema

A database that creates the structure of another database. For example, a schema specifies the queries, tables, fields, and data types in a database.

schema update utility

Functionality used to assist in processing existing product models to an updated database structure after you modify or add to the database structure.

service

The conductors and equipment for delivering electric energy from the secondary distribution or street main, or other distribution feeder, or from the transformer, to the wiring system of the premises served.

shield

As normally applied to instrumentation cables, refers to metallic sheath (usually copper or aluminum), applied over the insulation of a conductor or conductors for the purpose of reducing electrostatic coupling between the conductors, which may be susceptible to or which may be generating unwanted electrostatic fields.

side-wall pressure

The crushing force exerted on a cable during installation.

site

The top level in the Project Management hierarchy. A Site configuration may contain several Catalogs, each shared by multiple Plants.

site administrator

Person responsible for managing the standards and general parameters for a given plant site within a Site database.

site setup

Functionality associated with establishing a new plant site or hull for design development.

sketch and trace

User interface for rough definition of a required design feature that typically works in a 2-D mode.

slave run

The cableway run(s) that follow a master run as it is routed, following the same path offset by a constant distance.

specifications

Contracted requirements for the plant.

splice (electrical)

The physical connection of two or more conductors to provide electrical continuity.

station

User-defined point with a unique name on an object, such as a trunk, that identifies where other objects can pass through it; also called route numbers.

stud

A bolt, threaded on both ends, used to connect components.

suspended floor

A concrete floor system built above and off the ground.

switchgear

A general term covering switching and interrupting devices and their combination with associated control, metering, protective, and regulating devices; also assemblies of these devices with associated interconnections, accessories, enclosures and supporting structures, used primarily in connection with the generation, transmission, distribution, and conversion of electric power.

symmetric node

Type of vertex on a curve. A curve with a symmetric node has the same curvature on each side of the node. A handle can be attached to a symmetric node for editing.

system

A conceptual design grouping that organizes parts in hierarchical relationships. A system represents a functional view of the model and includes information such as system name, type, properties, and design specifications for the objects assigned to the system.

tag number

User-specific, unique number assigned to an object (for example, CV-101 for a control valve, HE-2002 for a heat exchanger).

target point

The origin for coordinate measurements displayed by PinPoint. You can position the target point anywhere on the drawing sheet or view.

terminal block

An insulating base equipped with terminals for connecting secondary and control wiring.

tolerant geometry

A type of ACIS geometry - either an edge or a vertex - that is outside the tolerance for ACIS and requires special handling.

trimmed surface

A surface whose boundary is fully or partially inside the "natural" geometric definition of the surface. Some or the entire control polygon extends outside the face boundary.

trunk

Feature that quickly reserves space for the distributive systems and other systems that have a path. Along the trunk are stations that define the cross section and identify part or system membership.

unit/module modeler

Facility of the system to structure collections of equipment and components into a single identifiable object.

user attributes

A customized property in the reference data. The Custom Interfaces sheets in the Excel workbooks define these properties. You can list the customized properties on the individual part class sheets.

version control

Ability of the system to manage multiple versions of a single part of the design. Version control should support conditional analysis and promotion status, as well as alternate design features among hulls within a plant site.

vertex

A topological object that represents a point in the three-dimensional model.

viewset

Set of objects (usually a subset of the entire database) that a view operation uses. Membership or lack of membership for any object in a viewset does not affect the actual stored representation of the object, but only its availability or desirability for viewing in the current scenario.

voltage drop

The difference of voltages at the two terminals of a passive impedance.

weight and CG analysis

Routines that compute the weight of commodity materials as configured in a given design (for example, plate and pipe) and determine total weight and center of gravity (CG) for a collection of material and equipment, as well as the complete plant.

welding

Weld requirements for joining materials. Welding length analysis is the calculation of required weld dimensions; also called leg length analysis.

wirebody

A topological object that represents a collection of edges jointed at their common endpoints.

wireways

Sheet-metal troughs with hinged or removable covers for housing and protecting electric wires and cables and in which conductors are laid in place after the wireway has been installed as a complete system.

wizard

Software routine attached to an application that provides guidance and expert help to you to complete one of the functionalities of the application.

work content

Estimation development of metrics from the database that relates to the work hour content of the various construction units.

work order

Plant authorization for completing work; synonymous with a job order.

working plane

The available 2-D plane of movement for endpoint selection.

workset

Set of objects (usually a subset of the entire database) used in an interactive change, add, or delete operation. Membership or lack of membership for any object in a workset does not necessarily affect the actual stored representation of an object. However, you can change or delete an object in a workset that also results in a change or deletion of the stored object. Similarly, when you add a new object (not currently stored) to a workset, the software also adds the object container.

workspace

Area that represents the portion of the model data needed to perform the intended task and includes the user modeling settings.

workspace document

Document into which you can extract a portion of the model data for a user task.

Workspace Explorer

Tree or list representation of objects in your workspace.

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